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THE

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OF

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PREFACE.

THE following Treatise aims at giving a connected and consistent view of the subject which it undertakes to explain, and of the relation in which the several parts of it stand to each other. Perhaps it will not be considered as departing from the proper self-restraint which leaves the question of originality to be decided by others, if the Author ventures to say that this connected view differs as a whole, and of course in some of its details, from any theory hitherto promulgated. Saying this is, indeed, putting forth no claim except to the attention of the reader, inasmuch as there can be no merit in any difference from former writers, unless that difference is founded in truth.

The Author designed at first to make the Treatise almost wholly expository; but the number of unsettled questions on which he had to touch, forced

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him more extensively into criticism and controversy than he had originally contemplated entering. In such a work it was especially impossible not to advert to the scholastic logic; and as his theory is at variance with some of its fundamental principles, he has had occasion to comment upon it at considerable length.

If, in doing this, he has, on the one hand, been obliged to differ very widely on certain points from several of the ablest logical writers of the day, he has, on the other, found himself in accordance on many of the same points with some of the most eminent philosophers of the past and present ages.

February 22. 1851.

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THE

THEORY OF REASONING.

CHAPTER I.

THE INTELLECTUAL OPERATIONS WHICH PASS UNDER THE NAME OF REASONING.

In scrutinizing our own minds, several different operations are easily distinguishable, and have accordingly received particular appellations. When present objects are discerned through the senses, the act is usually named perception; when objects formerly perceived by us, or facts formerly known to us, are recalled, the mental event is denominated recollection, or mere conception; when objects or facts occur to the mind in a different order or combination from that in which they were actually perceived, there is something more than conception, and it has been termed imagination; lastly, when facts perceived determine the mind to the belief of facts which it does not perceive, although here also

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conception is implied, the operation is evidently as distinct from the former three operations as they are from each other.

This intellectual process may be illustrated by a few familiar instances.

I am walking, I will suppose, on the sea-shore, and perceiving a quantity of sea-weed lying on the beach, while the water is at the moment a quarter of a mile from it, I conclude that the tide has ebbed, and left the weed where I perceive it lying.

I notice the print of a small foot on the sand, and I feel pretty sure that it was made by a child.

I look upon the multitude of gay people walking along the beach, and I am struck with the thought that sooner or later, and, at the latest, in no very long period, they must all die.

I observe the sun to be exactly on the meridian, and I calculate that at a place where a friend of mine resides, 15 degrees in longitude to the west of my position, it is just eleven o'clock.

In these several cases my mind is determined by the sight of present phenomena, conjoined with knowledge previously acquired, to believe something which I do not actually perceive through the organs of sense; something past, something future, or something distant; or, in other words, to believe that some event has happened, will happen, or is happening, although beyond the sphere of my observation.

But the actual presence of any facts to the senses

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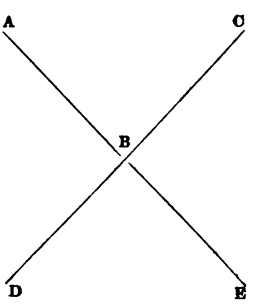
is not essential to the operation in question. I may recollect or be told of a fact, and thus knowing it from recollection or testimony, I may form the same inferences from it as if I perceived it.

This determination of the mind to the belief of something beyond its actual perception or knowledge, is obviously what is termed reasoning.

There is, however, another mental operation to be noted, which consists, not in our being led to believe, or in our inferring from what we perceive and know, something else, neither perceived nor known; but in our being led to discern some fact, not directly manifest, through the medium of some other fact or facts in which it is implied.

Suppose somebody to assert that the opposite angles made by the intersection of two right lines are equal. This, at the first glance, appears likely enough to be true; but it is not intuitively perceived, it is not immediately manifest. When, however, he proceeds to point out that the angles A B D and A B C are together equal to two right angles, and that the angles A B D and D B E are also together equal to two right angles, we discern that these two pairs of angles are equal to each other; and when he further points out the circumstance of the angle A B D being common to the two equal pairs, we at once discern that the other angle



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A B C of the first pair is equal to the other angle D B E of the second pair.

Here we do not infer the existence or the happening of something past, or future, or absent; but we are led to discern something not directly obvious, by an arrangement of propositions expressive of facts, each of which implies its successor.

To describe it more particularly:

The complex fact, or combination of facts, expressed in the proposition, "the two pairs of angles are respectively equal to two right angles," implies (or leads the mind to discern) that they are mutually equal; and the fact that the pairs, thus proved to be equal, have one angle in common, implies (or leads the mind to discern) that the remaining angle in the one is equal to the remaining angle in the other. Thus, if we regard the facts, there is self-evident involution or implication; and if we regard the mind of the reasoner, there is intuitive discernment at every step of the process.

The operation just described is termed reasoning equally with the other; but there is evidently an important difference between them. To be determined by facts to the belief of an unobserved event or object, past, present, or future, and to discern when two facts are presented to the mind, that one is implied in the other, are intellectual acts or operations plainly distinct. If there were no other circumstance by which to discriminate them, they would be broadly distinguished by this,

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that in the latter species of reasoning, every step being discerned to be necessarily true, the denial of the conclusion involves a contradiction, while in the former species it does not. The conviction in the one case, and the discernment in the other, have, nevertheless, this in common, that the fact expressed in the conclusion is not in either case evident of itself, but is arrived at through the medium of some other fact or facts.

Of these two species of reasoning, while the second has been uniformly termed demonstrative, the first has sometimes been called moral, and sometimes probable reasoning; but on account of the ambiguity of these appellations, as will be explained in the next chapter, I shall venture to speak of it under the designation of contingent reasoning. Although objections may doubtless be brought against the epithet contingent, so applied, it appears to me, on mature consideration, to be less exceptionable and more convenient than any other.

The facts which determine the mind to the belief, or lead it to the discernment of other facts not immediately manifest, are usually spoken of under the designation of evidence or proofs; and when expressed in propositions preceding a conclusion, under that of premises.

To reason, is to go through proofs or evidence for or against any alleged fact. Frequently the fact alleged or expressed in the conclusion is placed

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before the mind first, and the proof is adduced to substantiate it; but it also frequently happens, in the course of reflection, that a fact, or combination of facts, leads the mind to the belief or to the discernment of a fact before unknown, which is then seen in its logical place as the conclusion.

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CHAP. II.

CONTINGENT REASONING.

THE preceding chapter having shown that there are two distinct mental processes which pass under the name of reasoning, I purpose next to inquire more closely into the nature of the first of these processes, the principles on which it proceeds, and the foundation of its cogency.

SECTION I.

The Nature and Cogency of Contingent Reasoning.

Let us examine any simple instance of the first species of reasoning. The one already cited, respecting the sea-weed found on the beach, may serve the purpose. What takes place on such an occasion may be described as follows:—

Having previously observed the tide, in ebbing, leave the sea-weed high upon the beach, as I see it at the present time, the recollection of this fact

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causes me to believe that the phenomenon before me has had the same origin.

Here the mind is obviously determined by present appearances, conjoined with what has been previously observed, to believe in a past event which has not actually fallen under observation.

In the inference, also given in the preceding chapter, "that the gay people walking on the beach will, sooner or later, all die," the mind is likewise determined, by previous observation or knowledge, to the belief of events concerning the objects before it, which, from the nature of the case (being yet to happen), cannot have been observed; but there is this difference:—in the first example, a past event is inferred from other past facts; in the second, future events are inferred from past events.

It is scarcely necessary to point out again, that, in another illustration before adduced, a contemporaneous event or fact beyond the sphere of the reasoner's observation is inferred from what is taking place before his eyes, with the assistance of previous knowledge.

In all these examples alike the mind is determined to the belief of an event or fact not witnessed or known, or, in other words, it infers an event or fact which it has not the means of immediately observing.

For such inferences one condition is always necessary. The reasoner must have been acquainted

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with a similar case or similar cases. We are determined to the belief of an unobserved fact by having observed or known a similar fact to have taken place in similar circumstances. It is this resemblance in the cases which leads us to infer that unobserved events have happened, are happening, or will happen.

In simple cases, where the complete resemblance of objects or events is at once discerned, a single previous instance frequently suffices for an inference; but in complicated cases, where there is similitude with some degree of diversity, a collection and comparison of various instances is necessary to show that the diversity does not affect the essential circumstances on which the event depends, and that the instance about which we are reasoning does not differ from the others, in which the event has been observed, more than they differ from each other.

Thus, to revert to the examples already adduced, I may have observed the action of the tide on the sea-weed only once, yet, when I see the weed lying as before described, I instantly conclude that it has been left by the retreating waves.

In the same way, when I draw the conclusion that a child has passed over the sand, from the marks imprinted upon it, all that is necessary for the inference is the previous observation of a single fact of a similar kind.

On the other hand, when I conclude that my

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fellow-creatures around me will sooner or later die, my inference is from a large number of facts known to me in various ways, some gathered from personal observation, some collected from the history of the race, and the whole expressible in the proposition that all men in every climate, how different soever in constitution, character and habits, after living a certain limited period, have died.

It is obvious, that whether we can draw an inference from a single fact, or whether it is needful to have a collection of facts, depends altogether on what is requisite for establishing a similarity in the influential circumstances of each case, and does not affect the character of the reasoning, which is still inferring, or being determined by what we are cognisant of, to believe something beyond what is observed or known.

In the examples of reasoning already cited, the conclusions, it is to be remarked, are all relating to definite objects, and may be called particular inferences; but there is another large and important class of conclusions from analogous premises, which are general or universal.

The same facts which determine us to believe that a single individual, or that the crowd we see on the beach, will die, determine us to believe that all human beings will die; or, to express it in still more general terms, that all men are mortal. That these inferences which are usually termed general

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laws, are precisely of the same nature, and rest on the same evidence as particular inferences, is manifest. They both alike predicate the unknown from the known, and differ only in the extensiveness of their subject.

From what may be conveniently termed the collective fact, that men have hitherto been fallible as far as observation has extended, I may deduce the particular conclusion that an unknown and untried individual named Peter is fallible, and I may equally deduce the universal conclusion that all men are fallible.

In the latter case, it is instructive to mark the superior range of the inference from the same premises. The proposition that all men are fallible, not only embodies actual knowledge, but asserts an intellectual imperfection in human beings whose mental condition and endowments have never been ascertained. It affirms, not only that in all known or observed instances, men have been found fallible, but that all human beings who have existed in time past, unknown and unobserved, have laboured under the same defect; that all men now living, known or unknown, are subject to it; and that all who shall hereafter exist will also be similarly constituted.

In illustration of what has been said, let us place, side by side, the universal law, and the particular inference from the collective fact.

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COLLECTIVE FACT.

All men, as far as observation has extended, have been found fallible.

Universal Law.	*Particular Inference.*
Therefore all men are fallible. [*i. e.*, men of past times beyond the reach of observation, as well as those observed, *were* fallible; men of the present time, whether observed or unobserved, *are* fallible, and all future men *will be* fallible.]	Therefore the man Peter is fallible. *or,* The next generation of men will be fallible. *or,* Socrates, who lived more than two thousand years ago, was fallible.

It is obvious that both these conclusions, both the universal law and the particular inference, are deduced from the same fact or collection of facts: they are, if I may so express it, abreast, or co-ordinate; one is not, or needs not be logically subsequent to the other; or, to vary the language, both are probable inferences, for which the real evidence is the same. The mental process too is alike; it does not consist in the mind's discerning one thing to be implied in another, but in its being determined by known facts to believe unknown ones.

Much error and confusion, it appears to me, has arisen from not distinguishing between the collective fact, which is simply a summary of the evidence, and the general or universal law inferred,

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which goes beyond the evidence. I cannot help thinking, that Dr. Thomas Brown, with all his acuteness, has either not discerned the distinction, or not always kept it clearly in view, as, for example, in the following passage, which, even if I am not correct in my interpretation of it, will assist me to explain the point under consideration.

"If by the term *general law* be meant," he says, "the agreement in some common circumstances of a number of events observed, there can be no question that we proceed safely in framing it, and that what we have already found in *a number of events*, must be applicable to *that number of events*." —"But the only particulars to which in this case we can with perfect confidence apply a general law, are the *very particulars* that have been before observed by us."*

This might be taken as a good description of that which is necessary to constitute what I have termed the collective fact, but it would be an incorrect description of what is usually meant by a general law, unless we construe the phrase *the very particulars* to denote, not the identical facts, but exactly similar facts.

It would, however, be taking an imperfect view of the subject to suppose that we reason only from such collective facts as may be denominated uniform.

* Lectures, vol. i. p. 176.

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Besides the cases I have already noticed, where the similarity of the influential circumstances is maintained amidst a certain diversity in other respects, there are innumerable cases of a complicated, and not altogether definite character, in which a certain result has not always happened, but has taken place in more instances than it has failed to take place, and others in which a result has failed oftener than it has happened. When a new instance of the first kind presents itself, we infer the probability that the event will happen to be greater than the probability of its not happening; when an instance of the second kind is before us, we infer the probability of its happening to be less than the probability of the contrary; which probability, it is almost needless to observe, admits of degrees, according to the varying circumstances of each instance.

The nature of the reasoning in these cases is the same as in those where the facts are uniform, and it is only in the degree of probability which is recognized that the conclusions differ. It is obvious that the want of uniformity in the result is owing to a want of uniformity in the presence of the influential circumstances. Although the subjects of the proposition which expresses the fact are comprised in a general term or description, yet they are alike only in certain respects, and some of them differ in points on which the result depends. For example, it is a general observation, that man-

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kind follow the religion of their immediate ancestors; but this, although generally, is not invariably the case. Men are compound beings of varying qualities, and a few in almost every country, in consequence of peculiar circumstances, or intellectual idiosyncrasies, are found to depart from the hereditary creed: whence, if you happen to meet with a native of Turkey or Russia, you cannot infer, from his country alone, that the former holds the Mahometan faith, nor the latter that of the Greek Church. If your knowledge of this single circumstance is your only guide, your correct inference will be that he is very probably of the same religion as the great majority of his fellow-countrymen.

My explanation of the nature of contingent reasoning would be incomplete, without adverting to one point connected with it, which has not always been seen in its true light. Every act of reasoning (as I shall have occasion to show at greater length hereafter) proceeds upon, or exemplifies, some general principle; or, in other words, from every act of reasoning some general principle may be drawn or educed *, which may for shortness be called the principle of the reasoning.

* The term "*deduce*" being already appropriated to the operation of inferring conclusions from premises, it may contribute to precision, where precision is much wanted, to adopt the term "*educe*," to denote the process of forming or drawing out the general principle which, according to common phraseo-

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We have, therefore, to inquire, what is the principle of the species of reasoning now under consideration, and we shall find it to be as follows:— What has been observed to take place in a similar case, or in all similar cases, has taken place, is taking place, or will take place in the case before us, where actual observation is precluded; or, more briefly, without reference to time, similar events or phenomena take place in similar cases.

This will appear sufficiently manifest if we dwell for a moment on the conclusion before mentioned, that all the persons walking on the beach must sooner or later die. The reason, as we have already seen, which determines the mind to this conclusion is, that all human beings formerly living have died before attaining a certain age. Briefly expressed, the reasoning is —

All human beings formerly living have died before attaining a certain age:

Therefore, these human beings will die before attaining that age.

And the general principle which is exemplified here is, that similar events will take place in similar cases.

A principle of reasoning may hence be regarded as a generalised statement, or description of what our inferences consist in; or of what we do when we draw them. It may be remarked, too, that a

logy, is involved in an argument, or on which an argument proceeds.

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general principle of this kind includes subordinate or less general principles, as classes include genera, and genera include species. We might, for instance, from the last example educe the principle, "What has happened to all human beings formerly living, will happen to all now living." Moreover, as the chief cases of similarity are those of causation, the two main subordinate principles in contingent reasoning may be stated briefly to be, "Like causes produce like effects, and like effects proceed from like causes."

The next important point for our investigation is, how is the cogency of this kind of reasoning, which is confessedly not demonstrative, to be proved? To which I answer, that the cogency of no direct and simple process of reasoning can be the subject of proof. The only question is, does the reasoning, when clearly expressed, produce conviction? or, in other words, do the facts, when presented clearly to the mind, determine it to believe that which is expressed in what is called the conclusion? If they do, we have reached an ultimate fact, or law, or principle of our mental constitution beyond which it is impossible to go. It may be laid down as a general law or expression of this fact, that the human mind is determined to the belief of similar events in similar cases. The argument already cited, that the human beings whom we are now looking upon will die before reaching a certain age, because all other human beings, or rather all

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human beings formerly living, as far as observation has extended, have so died, produces conviction at once, and nothing can enhance or diminish its power. It is deserving of especial remark that drawing out the general principle implied in the argument or educible from it is of no avail in strengthening its force, although the contrary has been frequently assumed, and even expressly asserted. The cogency of the reasoning in the particular example is quite as manifest as that of the principle on which, according to the common phrase, it proceeds, or which is involved in it. The maxim that what has been observed invariably to happen in certain cases, has happened and will happen in all precisely similar cases, is only a generalisation of the reasoning which is exhibited in particular instances, and has no proving power of its own.

It is this step taken by the mind, or rather this determination of the mind by known facts to believe unknown ones, which gave rise to Hume's celebrated speculations in his chapter entitled "Sceptical Doubts." He was not satisfied to receive it as an ultimate principle beyond which we could not go, but wanted an explanation of its origin in some other principle. After remarking that from the fact of having been formerly nourished by eating bread, it does not necessarily follow that we shall be nourished by eating other bread, he proceeds, "At least it must be acknowledged that there is here a consequence drawn by the mind; that there is a

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certain step taken, a process of thought and an inference which wants to be explained. These two propositions are far from being the same, '*I have found that such an object has always been attended with such an effect*,' and '*I foresee that other objects which are in appearance similar will be attended with similar effects*.' I shall allow, if you please, that the one proposition may justly be inferred from the other: I know, in fact, that it always is inferred. But if you insist that the inference is made by a chain of reasoning, I desire you to produce that reasoning. The connexion between these propositions is not intuitive. There is required a medium which may enable the mind to draw such an inference, if indeed it be drawn by reasoning and argument. What that medium is, I must confess passes my comprehension; and it is incumbent on those to produce it who assert that it really exists, and is the original of all our conclusions concerning matters of fact." *

In this passage there are three points to be especially remarked. Hume affirms, 1st., that such inferences as he describes are always drawn, and justly drawn: 2. that the connexion between the inference and the proposition from which it is drawn is not intuitively perceived: 3. that the inference wants explanation; and while he himself asserts that a medium or chain of reasoning is required to enable us to draw the inference, he

* Sceptical Doubts, Part II.

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confesses that what that medium is passes his comprehension, and he challenges others to produce it. Now, in the first and second of these assertions he is perfectly correct, and his view of the subject corresponds with what has been said in the previous part of the present chapter; but in the third he requires an explanation which is needless, and he challenges his imaginary adversaries to produce what is totally uncalled for, and cannot possibly be given. If, as he says, an inference is unavoidably and justly drawn, no medium or chain of reasoning is needed to enable us to draw it. Drawing an inference *is* reasoning, and between the inference and the fact from which it is drawn nothing can, in the nature of the case, be interposed. All that he says merely shows that there is a species of reasoning in which we unavoidably infer unknown facts from known facts; and that this is a different species of reasoning from that in which we intuitively discern one fact to be necessarily implied in another.

Reid, Dugald Stewart, and Thomas Brown, do not follow Hume in his demand for a medium, but they unite with him in declaring that inferences of the kind in question are not drawn *by reasoning.*

If we construe this declaration literally, it amounts in fact to saying that *we do not reason by reasoning*, which may be true, but it is at all events nugatory. We cannot, certainly, be said with any propriety to do an act by the act itself, but who would think of making the assertion?

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There are two different propositions, relating to this point, which may easily be confounded, viz.: "these inferences are not drawn by reasoning," and "drawing these inferences is not reasoning." The former, as I have just explained, if taken literally, is a trifling and worthless assertion, which, perhaps, in fairness to these philosophers we ought not to attribute to them; they probably meant that such inferences are not demonstrated, and that there is no absurdity in supposing them to be false, the universal test of demonstrative arguments.

With regard to the latter proposition, viz. that "drawing these inferences is not reasoning," we are precluded from assuming this to have been their meaning, for it would be inconsistent with their own practice, which is constantly to speak of the drawing of such inferences *as* reasoning. Hume in one place denominates it experimental reasoning. Dr. Reid usually terms it probable reasoning, and one short passage selected from a number of others proves that by this phrase he intended to designate such inferences as are now in question. "In probable reasoning the connexion between the premises and the conclusion is not necessary, nor do we perceive it to be impossible that the first should be true while the last is false." *

Mr. Stewart uses language equally or still more

* Essays on the Powers of the Human Mind, Essay vii. chap. i.

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obviously in point, where he speaks of " the principle of my nature which leads me thus not only to *reason* from the past to the future, but to *reason* from one thing to another, which, in its external marks, bears a certain degree of resemblance to it." *

The words of Dr. Brown in proof of a similar use of the term reasoning, need not be cited in form. The reader will find a passage in his Lectures perfectly explicit and appropriate, where he speaks of the " reasoning of infants." †

It might be well, perhaps, if we had a generic name by which to distinguish contingent from demonstrative reasoning; but since we are accustomed to employ the same expressions in regard to both, applying to them in common such terms as *proofs*, *premises*, *consequences*, *inferences*, *conclusions*, and making use, in both cases, of the same causal and illative conjunctions, *because*, *inasmuch*, *then*, *therefore*, *consequently*, the only feasible plan seems to be, to discriminate them as species of the same genus. It seems impossible, without altering the whole structure of language, to do otherwise.

Another consideration in favour of this method is, that not only are contingent and demonstrative reasoning often intermingled, but there is much reasoning, as I shall hereafter explain, which

* Philosophy of the Human Mind, vol. ii. p. 241.

† Lectures on the Philosophy of the Human Mind, vol. ii. p. 526.

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partakes of the character of both; which, while it is contingent in reality, is demonstrative in form.

What is the most appropriate specific appellation that could be adopted for that reasoning which is not demonstrative, is a question of some nicety; nor will I pertinaciously contend that I have made the best possible choice in selecting the term *contingent*.

Some authors, as already stated, call this species of reasoning *moral*, and others *probable*, while a third class use the two epithets interchangeably. To the term *moral* there is the objection that it is already used in several acceptations; and further, that the reasoning so designated frequently relates to purely physical or material subjects. To the term *probable* there is the objection that it is usually employed in the sense of *likely*, and is qualified by epithets expressive of degrees. Cases might easily be imagined in which these two senses would clash: *e. g.* it might happen that we should have to prove by probable reasoning that an event was exceedingly improbable. *

* "The word *probable*," says Mr. Stewart, "does not imply [*i. e.* when philosophically used] any *deficiency* in the proof, but only marks the particular nature of that proof, as contra-distinguished from another species of evidence. It is opposed, not to what is *certain*, but to what admits of being *demonstrated after the manner of mathematicians*. This differs widely from the meaning annexed to the same word in popular discourse; according to which, whatever event is said to be *probable* is understood to be expected with some degree of doubt." — *Elements*, vol. ii. p. 252.

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Perhaps, one of the best designations is *inductive*, which was employed by Dr. Reid in his earliest work, but which he appears to have subsequently laid aside. Since induction, however, as commonly understood, denotes a complex operation, viz. collecting and scrutinizing facts, preparatory to inferring a general law from them, and sometimes inferring the general law itself, the designation seems hardly appropriate in simple cases, where, as is often done in this species of reasoning, we infer one particular fact from another.

The terms moral, probable, inductive, contingent, and demonstrative, direct the attention to the nature of the proofs or evidence before the mind, but we might select names which would point to the intellectual operations themselves.

Hume * and other writers, in discussing the origin of the inferences we draw from the past to the future, from the known to the unknown, have ascribed them to instinct; and philosophers generally have referred our discernment of the steps in demonstrative deductions to intuition.

Adopting this view and this phraseology, we might denominate the first species of reasoning

* See several passages in his "Sceptical Doubts," and "Sceptical Solution of these Doubts." I will quote, however, a passage from his "Academical Philosophy" on account of its brevity, certainly not of its consistency. "Nothing leads us to this inference but custom, or a certain instinct of our nature." — *Essays and Treatises*, vol. ii. p. 161.

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instinctive, and the second, *intuitive*. We infer instinctivelythat the bread we are eating will nourish the body as other bread has done: we conclude intuitively that the lines A and B being respectively equal to C are equal to each other.

On giving the subject, however, the best consideration in my power, I have preferred the terms contingent and demonstrative, without precluding myself from the occasional use of any others when no misunderstanding can arise. If the former is not absolutely the most appropriate (in regard to which there is fair scope for diversity of taste and judgment), it will at all events enable me to explain my views with sufficient precision: respecting the latter, I am not aware that there ever has been any difference of opinion whatever.

SECTION II.

Contingent Reasoning distinguished from Knowing on the one hand and Conjecturing on the other.

There is one objection which, I am aware, may be urged against the view now presented of the reasoning process in contingent matters, and it is this, that it would dignify nearly every intellectual act with the name of reasoning; that it would, on the one hand, confound reasoning with positive knowing, and, on the other, with mere conjectur-

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ing; embracing many cases of instantaneous and habitual apprehension which it would seem puerile to term cases of inference, and many others which are bare guesses or whims of the imagination.

The allegations here supposed might, however, be allowed, might even be true, without at all invalidating the representation of the reasoning process against which they are directed. It would be no impeachment of the doctrine of this treatise to admit, that although there is a broad distinction between the mental acts alleged to be confounded, when we consider very decided cases, yet in many instances it would be difficult to draw a line of demarcation on either side. The colours of the rainbow which are sufficiently contrasted when we regard the middle of each stripe, are so insensibly blended together that it is impossible to perceive where one ends and the other begins, yet no one on this account denies the existence of the seven prismatic colours or the propriety of giving them separate names: and, in the same way, whatever difficulty there might be in drawing a line between knowing and reasoning, and reasoning and conjecturing, in certain instances, these operations might still be regarded as perfectly distinct.

Such a line, nevertheless, may I think be drawn in the former and principal of these cases, although it may not be altogether coincident with common phraseology.

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The doctrine of the preceding pages is, that when our minds are determined by present facts, conjoined with experience or knowledge, to believe some fact past, absent, or future, we reason.

From the sounds which at the moment of writing I hear through the open window of my room, I am led to conclude that there is a lark warbling in the sky, although I am unable to see it. The printed page before me superinduces upon my mind the belief that, at some antecedent period, human beings put together the words and impressed the characters on the paper, although I have not the slightest information regarding the individuals who did so. In like manner, I feel assured that the buds on the rose-trees in the shrubbery will soon expand into full-blown flowers, and that the stone which I see a boy about to throw into the fish-pond will sink in the water.

These according to the definition are all cases of reasoning. On examining them they all agree in this, that from something actually present to my senses conjoined with past experience, I feel satisfied that something has happened, or will happen, or is happening, beyond the sphere of my personal observation.

The objection we are considering would go to maintain that these are not all cases of reasoning, but that some of them are cases of knowledge. "We *know*," it may be said, "that the stone which

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we hold in our hands will sink when thrown into the water; we do not infer it."

But may not the same be asserted with equal truth of the usual examples of reasoning given in logical treatises? When it is argued that Peter is mortal (*i. e.* will die) because he is a man and all men are mortal, is not my knowledge or belief that Peter is mortal exactly on a level with my knowledge or belief that a stone will sink in water? And if the former is a legitimate conclusion from premises or an inference, is not the latter equally so?

It will be readily granted on all hands that what has taken place before my eyes I know. I know, for example, that I threw a stone yesterday into the water and that it sank: but with what propriety or correctness can I be said to know that the same stone will sink if I again throw it into the water to-day? And if this act of intelligence which regards an event that has not yet happened, is to be called knowledge, can I be said to know that a different stone will sink? And if this is also to be called knowledge, can I be said to know that another substance which I have never tried, but which appears almost as heavy as stone, will sink too?

Suppose the weight attenuated, suppose a number of substances presented to me varying from the weight of granite to that of cork, where in this descending scale of untried substances does knowledge end, and inference or conjecture begin?

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There appears to me to be only one solution of this difficulty and one line to be drawn. In philosophical strictness we can be said to know only those things which we perceive or have perceived through our organs of sense, and those states of mind or mental events of which we are or have been conscious.

Other things we believe on evidence more or less cogent, that is to say, they are matters of inference: the only difficulty in the question seems to be, whether when we assume or think that the same identical properties which we have once perceived, are possessed continuously by the same identical thing, our intellectual state or act is to be termed inferring or knowing? Whether, in the case already put, when I make sure that the same stone which I saw sink in the water yesterday, will sink again when thrown into the water today, I *know* the stone will sink, or I only infer it? and this, when maturely considered, seems to be a question of terminology and not of fact.

There are certainly reasons to be urged, although they are difficult to explain, why in this case we should use the term knowing. What do we mean by the expression "*the same thing*"? We mean a definite portion of matter possessing certain perceptible qualities — a definite congeries in fact of such qualities. When, then, I feel sure of finding in future the same object to possess the same qualities as heretofore, it is only feeling assured

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that a definite portion of matter will continue to be what it is — to continue in fact to exist.

I perceive the properties of a piece of gold: I put it aside in my cabinet: when I take it out again, I rely upon the continued existence of those properties. It is the properties themselves which constitute the whole object. Knowledge of it can consist of nothing else than a cognizance of these qualities, and as I ascribe permanence to the object, I ascribe permanence to the qualities, the assemblage of which, in truth, forms the object, and I speak of them independently of reference to time.

But even in this case there is an inference that the definite portion of matter continues unaffected by surrounding agents; that is to say, without any addition or diminution, or any change of internal structure. We may conclude that it continues the same, from its not having, as far as appearances indicate, been exposed to the action of such agents; but as these are often extremely subtle and imperceptible, we cannot know this. Instead of putting aside a piece of gold, I put aside a vessel of water: it is apparently protected from alteration internal or external; but the weather becomes colder, the temperature of the water falls, and although the liquid may appear the same to the eye, it has really undergone either a diminution or enlargement of bulk. Its continuing therefore to have the same properties is what I infer, not

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what I know; for if I consider it to have the same specific gravity as before I am in error.

On these grounds, notwithstanding the instantaneousness and certainty and familiarity of our intelligence in cases of this kind, they ought philosophically to be considered as cases of inferring and not of knowing.

Whether this be considered a satisfactory view of the subject or not, it fortunately happens that the determination of the difficulty is of no practical moment. There can be no great evil in confounding knowledge and inference in cases where they are so hard to be distinguished, or rather where there is so little reason for preferring one term to another, and where, whatever name we give to the intellectual act, it is marked by so much promptitude and certainty.

While on the one hand the conclusions of reason, when indubitable and familiar, are with difficulty distinguished from facts actually known, on the other hand it is not easy, according to the objection before us, to distinguish them, when they are founded on doubtful premises, from what are called guesses or hypotheses. But in this case the solution lies on the surface. We impose one name or the other according to the degree of evidence.

When the grounds for believing any thing are slight, we term the mental act or state induced a conjecture; when they are strong, we term it an inference or conclusion. Increase the evidence

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for a conjecture, it becomes a conclusion; diminish the evidence for a conclusion, it passes into a conjecture.

The process which ends in a conclusion and the process which ends in a conjecture are thus essentially the same, and differ only in degree or in the force of the evidence. A conjecture, therefore, if it has any grounds, is a species of conclusion: if it has none, it may be called a mere guess, a whim, or caprice or sally of the imagination, or any thing else implying disconnexion with proofs and premises, which the reader may choose to term it, but it has no claim to the appellation of inference.

After this discussion it is scarcely needful to combat the phraseology of Hobbes, who styles all that I have denominated contingent reasoning, conjecturing.* If the latter term were not confined to cases in which the grounds of inference are slight, all conclusions from historical facts would pass under the name of guesses, and the criminal found guilty of murder on circumstantial evidence might be said to be hanged on conjecture.

* Human Nature, chap. iv.

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CHAP. III.

DEMONSTRATIVE REASONING.

LET us turn, in the next place, to the second species of reasoning, in which certain things or facts lead us to discern other things or facts not immediately manifest by themselves. An example of it having been already given in the first chapter, and a still more detailed one being intended for the Appendix *, in order to avoid interrupting the exposition of the subject by too great particularity, the simplest instance will here suffice: the lines A and B are respectively equal to C, and therefore they are equal to each other.

Here the mind observing successively the equality of A to C and that of B to C, is thence led to discern the mutual equality of A and B, which is not self-evident or immediately discernible from the inspection of A and B alone.

It is plain that in reasoning of this second species, which is with great propriety termed demonstrative, we intuitively discern, at each step, that one fact implies another, and discern too that a denial of the implied fact involves a contradiction.

But demonstrative reasoning is not confined to

* See Appendix, Article 1.

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the science of quantity. It is to be found in all departments of human knowledge.

Whenever the mind discerns one fact to be implied in another, or the exclusion of a fact to be implied in another fact, it reasons demonstratively, whether they are facts of quantity or otherwise.

Examples of this truth might be multiplied without end, but the few which follow will be sufficient for illustration.

That portrait is a striking likeness of two different persons; therefore they must resemble each other.

The two litigants cannot both be the exclusive owners of the property in dispute; therefore one of them must be urging a wrong claim.

The traveller who was attacked had no money with him; therefore he could not be robbed of a large sum as reported.

The planets are opaque bodies; therefore they must shine by light derived from an external source.

Under this species of reasoning must be ranked that which is usually denominated syllogistic, but which I shall venture to call class-reasoning, because perfect specimens of it, as I shall hereafter show, are found in the form of enthymemes.

Of class-reasoning, or at least of so much of it as exemplifies the maxim of Aristotle, termed the *dictum de omni et nullo*, the characteristic is, inferring some attribute to belong or not to belong to a given individual or to given individuals of a class, because it belongs to all or does not belong

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to any of the individuals of the class. It would be clearly a self-contradiction to admit the latter and to deny the former. All such reasoning is obviously demonstrative: it is, indeed, largely interfused in geometrical demonstration, in which general propositions not self-evident, but which have been shown to be implied in other propositions, are subsequently employed as major premises. Such, for example, are the propositions that the angles at the base of an isosceles triangle are equal; that the three angles of every triangle are together equal to two right angles; and that all equilateral triangles are equiangular.

That all demonstrative reasoning consists in discerning, and, when expressed in words, in asserting, one fact or one proposition to be implied in another, is plain. If we call one the implying fact, the other will be of course the implied fact, as in the following examples.

IMPLYING FACTS.	IMPLIED FACTS.
All horned animals are ruminant.	This horned animal is ruminant.
The lines A and B are severally equal to C.	The lines A and B are equal to each other.
The three angles of every triangle are together equal to two right angles.	The three angles of the triangle ABC are equal to two right angles.
The culprit at the bar was in Edinburgh at one o'clock on the day named.	He could not be guilty of the offence committed at that time in London.
The traveller had no money with him.	He could not be robbed of a a large sum.
The portrait resembles two different persons.	They must resemble each other.

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By the terms *implying* and *being implied* nothing is assumed: they are merely expressive of the truth, that when the two facts so denominated are presented together to the mind, the proposition enunciating the second fact is at once seen to be true if the proposition enunciating the first is true, and the denial of it to involve a contradiction: nor is it pretended that this mode of stating an argument is superior for common purposes to the usual forms.

If we examine the general principles on which demonstrative reasoning proceeds, or which it exemplifies, we shall find less uniformity than in the case of contingent reasoning.

The general principle exemplified in the argument, that A and B are equal to each other because they are respectively equal to C, is, that things equal to the same thing are equal to each other. In the demonstration cited in the first chapter, that the opposite angles made by the intersection of two right lines are equal, the reasoning consists of two steps, the first of which proceeds on the same axiom, while the second exemplifies the axiom, that if equals are taken from equals the remainders are equal.

In the argument that because the culprit at the bar was in Edinburgh at a given time, he could not be guilty of a crime committed at that precise moment in London, the general principle exem-

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plified is, that a man cannot be in two places at the same time.

Axioms might easily be educed in the same way from the other examples of demonstrative inference furnished in the preceding pages; but as I purpose to resume the consideration of such maxims in a subsequent chapter, it would be superfluous to dwell upon them here. In that chapter, I shall enter into an express examination of the general principles exemplified in class-reasoning, one of which has become so noted under the name of the *dictum de omni et nullo.*

The remark before made regarding the cogency of the process in the first species of reasoning, may be repeated with regard to the second. Its cogency is not susceptible of proof. If the argument that "because A and B are respectively equal to C they are equal to each other," is not intuitively discerned to be true, nothing can make it appear so. It would be idle, too, in this case, as in the case of probable reasoning, to cite the general principle with a view to strengthen the force of the particular instance. The maxim that all things which are equal to the same thing are equal to each other springs up in the mind after the mutual equality of two particular things which are equal to a third thing has been discerned, and is merely a generalisation of what the particular fact implies; a truth which will be more fully elucidated in the two following chapters.

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I have already remarked that all class-reasoning, or what is usually termed syllogistic, is in form at least demonstrative. This is, I believe, universally allowed; but it has been objected against such reasoning that the major premise virtually contains the conclusion, and consequently every argument of the kind involves a *petitio principii*, or at least furnishes no real or no new inference.*

What truth there is in this allegation, and whether, if true, it renders class-reasoning nugatory and useless, it may be instructive to examine. In this examination I shall confine myself at present to those cases of class-reasoning which according to a common logical distinction are demonstrative, both in form and in matter, as I purpose in the next chapter to consider such as are really contingent, although bearing the semblance of demonstration. In order to simplify the discussion, I shall also confine myself, as my predecessors have usually done, to such class-reasoning

* See Campbell's Philosophy of Rhetoric, book i. chap. iv., and Stewart's Elements of Philosophy, vol. ii. p. 100. Descartes had long before made a similar observation. "To convince ourselves," says he, "how little this syllogistic art serves towards the discovery of truth, we may remark that the logicians can form no syllogism with a true conclusion, unless they are already acquainted with the truth that the syllogism developes. Hence it follows that the vulgar logic is wholly useless to him who would discover truth for himself, though it may assist in explaining to others the truth he already knows." — *Works by* M. Cousin, vol. xi. p. 255., quoted by Mr. Hallam in his *Literature of Europe*, vol. iii. p. 260.

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as exemplifies the first half of Aristotle's maxim, viz. *de omni*, without expressly touching on such as exemplifies the second half, *de nullo*, or any other maxims allied to the dictum.

If it were intended to signify simply that the major premise *implies* the conclusion, the objection would allege as an imperfection what is the essential characteristic of all demonstrative reasoning whatever; inasmuch as in every case of it, one fact or proposition termed the premise, with or without the aid of another premise, as will be hereafter explained, implies another fact or proposition termed the conclusion. If the first did not imply the second, *i. e.*, if of the two facts, when viewed together, one were not discerned to be conclusively connected with the other, there could be no such thing as demonstration.

But the objection is, that the major premise not merely implies but contains the conclusion; that the conclusion is in reality a constituent or integrant part of the major premise, without which the latter would not be completely true.

This allegation, it must be confessed, cannot be contradicted. The force of the reasoning in a demonstrative syllogism, or an enthymeme with a major premise, depends altogether on the fact expressed in the conclusion forming an integrant part of the general fact expressed in the major proposition, and consequently no new or unknown fact can ever appear as the inference.

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The essence of the conclusion, in such cases, consists in asserting that the subject of it *does* form an integrant part of the major premise.

But although the allegation must be admitted, it does not by any means prove that such reasoning is nugatory or useless. It may, obviously, be of service to be reminded, or to remind others, or to have distinctly brought into view, that a given individual of a class possesses a certain attribute, when there is at the moment no other evidence to prove it, by citing the known or admitted fact, that all the members of the class possess it.

As an illustration of this point, suppose I am engaged in the demonstration of a geometrical theorem: there is before me a complicated diagram containing, amongst several figures, a triangle which I have to compare with other figures, and, as a step in the reasoning, I have to show that the angles of the triangle in question are together equal to two right angles. I have not gone through the proofs with this particular triangle, but I call to mind that I have seen the proposition demonstrated of all triangles whatever; and from it, as an established truth, the conclusion that the angles of the triangle in the diagram, although not expressly investigated, are together equal to two right angles, irresistibly follows. It is simply thinking or saying "in all triangles the three angles are equal to two right angles, and of course the particular triangle before us is included in the general fact."

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Whether the declaration or recognition of such a contained fact is to be termed an inference or not, seems to be a question of phraseology.

I am myself disposed to think that any fact which can be shown to be implied or contained in another fact, may be conveniently and properly said to be inferred from it, and that the process may be with equal convenience and propriety termed reasoning. It is true that on this plan many implied facts, when expressed in words, would assume the appearance of fruitless and frivolous inferences, and seem, as the phrase is, "not entitled to the name." But a similar remark might be made with regard to many other convenient designations. We give the name *proposition*, for example, to any expression which affirms or denies one thing of another *; and far from withholding it from trite and flat phrases and truisms, we constantly speak of puerile, nugatory, and identical propositions. In the same manner we talk of bad poetry and wretched painting, although the critic in his righteous indignation may cry out, Do you call this poetry? it is sheer rant; Do you dignify this with the name of painting? it is a mere daub. It would be in analogy with these examples to apply the term inference to any proposition before which we can

* Πρότασις μὲν οὖν ἐστὶ λόγος καταφατικὸς ἢ ἀποφατικὸς τινὸς κατά τινος. — *Aristotelis Analytic. Prior.* lib. 1.

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properly use the word *therefore*, marking our sense of its low character when requisite by such epithets as useless or frivolous. Of this description would be the logical trifling sometimes cited, —

All men are fallible ;

Therefore some men are fallible.

But there are other propositions prefaced by *therefore* which, although generally banished from the rank of conclusions, or regarded as mere examples of conversion, might be classed amongst the really useful inferences ; *e. g.*,

No man is infallible ;

Therefore no infallible being is a man.

All instances of the conversion of propositions, indeed, are really instances of demonstrative reasoning. They are pure enthymemes which require no major premises, although it is perfectly practicable, as it is perfectly useless, to throw them into the full syllogistic form. Of this I shall furnish proof in a subsequent chapter on the forms in which the operations of reasoning may be expressed.

The last example, in truth, represents a class of demonstrative inferences exceedingly common, where the same fact is presented in two different aspects, or approached by the mind in two opposite directions, and an assertion is made that because it is true in one aspect, it is true in the other.

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These two aspects are sometimes positive and negative, as,

The man we are speaking of is enslaved by his appetites;

Therefore he is not free.

They are sometimes active and passive, as,

The Duke of Wellington vanquished Bonaparte;

Therefore Bonaparte was vanquished by the Duke.*

Sometimes such inferences amount to little more than varieties in the expression of the same fact, and many of them undoubtedly seem puerile, but they are demonstrative, and, notwithstanding their apparent puerility when standing alone, they are often convenient stepping-stones in argumentative discourse, when their trivial character is merged in their transitional utility.†

All these we may rank amongst convenient and useful inferences, and with equal reason we may place in the same class such as we have been engaged in discussing — those, namely, of really demonstrative syllogisms — notwithstanding the un-

* A modern author, in reference to a similar example, says, "We either think that Philip was beaten by Peter, or that Peter beat Philip; two distinct thoughts, though relating to one fact. In reading from the tablet of our mind, we may bring forward the images in one order, or in another." — *Outline of the Laws of Thought*, p. 109.

† For some actual examples of such inferences as are here described, see Examination of a passage from Burke in the Appendix, Article 1.

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deniable fact that the conclusion is always contained in the major premise.

The admission of this truth detracts, it must be owned, from the importance of demonstrative class-reasoning as it stands in general estimation, and circumscribes such reasoning within very narrow boundaries.

It is an obvious reflection, that if no fact can be inferred in syllogistic reasoning but what is contained in the major proposition, no science can possibly be constructed by a series of real or legitimate syllogisms alone. Hence there must be a fallacy in the assertion that the science of Geometry can be exhibited in such a series. This feat has, I am aware, been ostensibly accomplished, and the way in which it has been performed presents no difficulty *; but, as I shall hereafter have occasion to show, it has been done solely by the introduction of redundant propositions, merely incumbering the demonstration, and disguising the real source of the validity of those arguments into which they are so unavailingly intruded. Such syllogisms may be fairly termed spurious.

* In Stewart's Elements, vol. ii. p. 260, it is stated that the first six books of Euclid had been exhibited in syllogisms by two writers named Herlinus and Dasypodius. See also Sir Wm. Hamilton's Edition of Reid's Works, p. 702, where the same fact is mentioned.

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CHAP. IV.

CONTINGENT UNDER THE FORM OF DEMONSTRATIVE REASONING.

I HAVE now taken a survey of contingent and demonstrative reasoning, and endeavoured to show the nature and cogency of each species, and also the general principles on which they proceed or which they exemplify.

But I have still to notice a large class of cases in reasoning which partake of the character of both; which, while they are contingent in reality, are demonstrative in form.

It has been already explained that the formation of general laws, extending beyond the observed facts from which they are derived, is, in every instance, an act of contingent reasoning; that general laws rest on the same evidence or are deduced from the same premises as particular inferences.

It is, nevertheless, a common and often a very convenient practice, first to deduce the general law, and afterwards from the general law to draw the particular inference, which then wears the appearance of a demonstrated truth.

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The subject may be elucidated by an instance of reasoning similar to one before given.

All human beings, as far as observation has extended, have been found fallible;

Therefore the unknown author of the book just put into my hands is fallible.

This, which is a good material argument, an instance of forcible contingent reasoning, may be converted into the following demonstration by assuming as a major premise the general law which is deducible from the preceding uniform fact.

All human beings are fallible;

Therefore the author of this book is fallible.

It is obvious, nevertheless, that the real nature of the reasoning cannot be altered by changing the form in which it is expressed. The evidence of the fallibility of human beings consists in previous known instances of the intellectual qualities exhibited by them; and the conclusion drawn from these instances is as to the intellectual qualities of a writer concerning whom we know nothing. The process is really inferring from what has existed in all similar, *i. e.* all other cases, what exists in this case.

As a further illustration, let us examine a piece of reasoning often cited in logical treatises.

All horned quadrupeds are ruminant;

Therefore this horned quadruped is ruminant.

Whether we take this enthymeme as it is, or make it, by the introduction of a minor premise, into a regular syllogism, the conclusion drawn is

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irresistible. You cannot admit the premise and deny the conclusion, without self-contradiction.

But the form into which the reasoning is thrown by using the general law as a major premise masks the real nature of the evidence for the conclusion. The real argument is,

All *other* horned quadrupeds have been found to be ruminant;

Therefore this horned quadruped is ruminant.

It is because we have found horned quadrupeds to have been ruminant in all *other* cases, as far as our knowledge has extended, that we conclude that the horned animal before us is ruminant. The fact or collection of facts gathered from observation without any contrary instance, is sufficient to determine the mind to believe the conclusion; but there would be no self-contradiction, although a want of sound sense, in admitting the premise and denying the inference. The reason is not what is usually designated logical or demonstrative, but material or contingent. It is, nevertheless, all that we can possibly have in the case.

Laying down the general law, that all horned quadrupeds are ruminant, has not the slightest power to change either the character of the facts of which it is the indication, or that of the conclusion to which it may lead. Material arguments cannot be converted into demonstrative proofs by any arrangement of propositions, or by any translation from one form into another.

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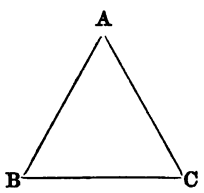
In these observations, I do not of course intend to assert that we ought never to make our inferences from such general propositions, for there is obviously a natural tendency in the human mind to do so, and an indispensable convenience in the practice. I simply maintain that they do not increase, or strengthen, or alter in any way, the real force of the proofs. Being conclusions of precisely the same nature, and resting on the same evidence as the particular conclusions sought to be demonstrated by them, it follows that no force can be derived from them to the latter. *

Perhaps it would be a useful way of marking the distinction between these two modes of contingent reasoning, to call one the direct and the other the indirect.

The difference might be illustrated and exhibited to the eye in a diagram, where the point or angle



A denotes the collective fact;
B „ the general law;
C „ the particular inference.

Supposing the distances between the points to be equal, or, what is the same thing, the triangle to be equilateral, it is obvious that if you proceed in a straight course from A, you may get to B or to C with equal readiness; but you may also get to C

* This argument has been forcibly put by Mr. John Mill, in his valuable System of Logic. See vol. i. p. 250.

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by first going from A to B, and then from B to C: the first would be the direct way, the second the indirect. So, inferring from the collective fact "all men have hitherto been found fallible" (A), that this man is fallible (C), would be a direct inference from the evidence, as would be also inferring from the same collective fact that all men are fallible (B); but inferring from the general law "all men are fallible" that this man is fallible, although direct if no reference is made to the original ground, would be an indirect way of deducing the particular inference from the pristine evidence on which it rests: it would be going from A to C *viâ* B.

It often happens, indeed (to pursue the parallel) that we find ourselves at B, and then, if we want to proceed to C, it would be roundabout to retrace our steps first to A. When we have already reached a general law, we may safely and usefully deduce conclusions from it, without the constant necessity of re-ascending to the original evidence.*

It follows, nevertheless, that the universal law, which is itself merely an inference in contingent reasoning, cannot be rightly employed, as a demonstrative major premise to prove a particular conclusion, without what may be called a logical reservation. The conclusion is not, in reality, a necessary consequence of the evidence, although

* It is scarcely necessary to say that the diagram above introduced is not intended to *prove* any thing: it is merely an attempt to place the subject in a clear light.

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the shape into which the argument is thrown will make it appear such; and deducing it from the universal law can be considered only as a form of which it is frequently convenient to avail ourselves, but in using which, we should never forget the contingent character of the argument. In effect, if we closely scrutinise the subject, we shall find that the only kinds of general propositions which can be legitimately regarded as implying individual facts, and thus employed absolutely as demonstrative premises, are two, namely, such as are formed from a complete knowledge or discernment that the predicate is true of every individual of the class (which embraces the *enumeratio plena* of logicians), and such as are rigidly deduced from incontrovertible *data*. An example of the former may be seen in the propositions, "all the planets are opaque bodies," "all murders are punishable by death;" of the latter, in the theorem "all equilateral triangles are equi-angular.

In all other cases, however forcible, or well-established, or undeniable the general law may be, the reasoning in which it is employed as a major premise, although demonstrative in form, comes under the description of contingent reasoning, and can be correctly regarded in no other light.

From all this, the necessity of knowing the precise signification of the terms used in class-reasoning before we can determine the real nature of the inference drawn, is an obvious corollary.

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But the most important application of this view of the subject, is that it enables us to see how completely such apparently demonstrative reasoning escapes the objection brought against syllogistic arguments, and adverted to in the last chapter, that the major premise virtually contains the conclusion, and that, consequently, the argument involves a *petitio principii*, and furnishes no real inference.

Many minds have been perplexed in attempting to reconcile the admitted truth, that the conclusion forms an integrant part of the general proposition from which we set out, with the equally acknowledged truth that from such propositions we deduce unobserved facts, not really included in the major premise.

But the view of the subject here presented removes the whole difficulty. Whatever weight the allegation of a *petitio principii* may have in the case of purely demonstrative class-arguments, it can have no application to such as we are here treating of, when thrown back into their pristine form. Although it may lie against an argument in the shape of

All men are fallible,
Therefore this man is fallible,

it cannot for a moment be brought against one in the shape of

All other men have been fallible,
Therefore this man is fallible,

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which is the true type of contingent reasoning from collective facts or general propositions.

In this latter case, all semblance of *petitio principii* vanishes: the difficulty is cleared up; a fact is inferred which has not been observed and is not included in the premise. And as the greater part of our reasoning from general propositions respecting the events around us, material and moral, is of this character, however it may wear the guise of demonstration, the objection before us, as already intimated, can at the utmost have only a comparatively limited application, viz. to deductions from such general propositions as can alone be employed absolutely as demonstrative major premises.

Perhaps the subject may be rendered clearer to some readers by the following dialogue.

A. It is surely demonstrative reasoning when I conclude that this man is fallible because all men are fallible.

B. That is to say, because every individual man is fallible.

A. Of course.

B. In asserting every individual man to be fallible, do you include this man or do you not?

A. I include all men, and him amongst the rest.

B. Then your argument is this, "Every individual man, including this man is fallible; therefore this man is fallible:" in other words, you argue

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that this man is fallible because he is fallible, which is certainly demonstrative enough.

A. Of course the reason really meant to be assigned is, that all *other* men, as far as observation has extended, have been found to be fallible.

B. That is to say, all men, excluding this man, have been found to be fallible, therefore this excluded man is fallible. Now this is a good material or contingent reason, but it is not a demonstratively conclusive one. In the case of every demonstrated truth, the opposite or negative proposition would be a contradiction in terms. That this man is *not* fallible would be a contradiction to the proposition that all men *are* fallible, but not to the proposition that all *other* men are fallible. Thus, if you include this man you beg the question: if you do not include him your reason is a material or contingent one, very highly probable, engendering almost complete certainty, but not demonstratively conclusive.

What has been said in this chapter may appear on a first glance to correspond with the well-known distinction made by Aristotle between demonstrative and dialectical syllogisms; but there is a fundamental difference, which it may be well to note. His words are, "The syllogism is a form of language in which certain things being laid down, another thing different from those laid down necessarily results from them. Now demonstration takes place when a conclusion is drawn from

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things true and primary, or from those of which the knowledge has been derived from the true and primary. But in a dialectical syllogism, the conclusion is drawn from probable things. The true and primary are such things as are believed of themselves, and not on account of other things: for it behoves not that in the principles of a science *the reason why* should be sought for, but every principle should be certain in itself." *

This is in truth merely saying that when the premises are only probable, the conclusion will be so too, and giving the appellation of dialectical to syllogisms in which they occur.

* Ἔστι δὴ συλλογισμὸς λόγος ἐν ᾧ τεθέντων τινῶν ἑτερόν τι τῶν κειμένων, ἐξ ἀνάγκης συμβαίνει διὰ τῶν κειμένων. Ἀπόδειξις μὲν οὖν ἐστίν, ὅταν ἐξ ἀληθῶν καὶ πρώτων ὁ συλλογισμὸς ᾖ, ἢ ἐκ τοιούτων ἃ διά τινων πρώτων καὶ ἀληθῶν τῆς περὶ αὐτὰ γνώσεως τὴν ἀρχὴν εἴληφεν· διαλεκτικὸς δὲ συλλογισμὸς ὁ ἐξ ἐνδόξων συλλογιζόμενος. Ἔστι δὲ ἀληθῆ μὲν καὶ πρῶτα τὰ μὴ δι' ἑτέρων ἀλλὰ δι' αὑτῶν ἔχοντα τὴν πίστιν· οὐ δεῖ γὰρ ἐν ταῖς ἐπιστημονικαῖς ἀρχαῖς ἐπιζητεῖσθαι τὸ διὰ τί, ἀλλ' ἑκάστην τῶν ἀρχῶν αὐτὴν καθ' ἑαυτὴν εἶναι πιστήν. — *Topicorum* lib. i. cap. 1.

The same point is thus explained by Wallis.

" Syllogismus *Topicus* (qui et *Dialecticus* dici solet, et *Didascalicus*) talis haberi solet syllogismus (seu syllogismorum series) qui firmam potius præsumptionem, seu opinionem valdè probabilem creat, quam absolutam certitudinem. Non quidem ratione *formæ* (nam syllogismi omnes, si in justa forma, sunt demonstrativi; hoc est, si præmissæ vera sint, vera erit et conclusio), sed ratione *materiæ* seu præmissarum; quæ ipsæ, ut plurimum, non sunt absolute certæ et universaliter veræ; sed saltem probabiles, atque ut plurimum veræ."—*Institutio Logicæ*, lib. iii. cap. 23.

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But this is not all that is maintained in the present chapter, nor even the material part of it.

My doctrine is, that all such reasoning as consists in inferring unobserved facts from general propositions, although strictly demonstrative in form, is in reality contingent, how certain and indisputable soever the general propositions may be; and that it is represented by the formula,

All other men have been found fallible;
Therefore this man (whose fallibility has never been observed) is fallible.

According to my view, consequently, many syllogisms would rank in the class of arguments demonstrative in form but contingent in reality, besides those which, in the popular use of the term probable, have only probable premises. If I understand Aristotle aright, the latter alone would fall under his denomination of dialectical.

It has been well observed by Mr. Stewart in reference to this distinction in the first book of the Topics, that there is an impropriety in such an employment of the epithets demonstrative and dialectical, inasmuch as it implies, or seems to imply, that one species of syllogism may be more conclusive and cogent than another*, which is at variance with Aristotle's own doctrine in other places, and of course was not intended here.

* Elements of the Philosophy of the Human Mind, vol. ii. p. 262. 8vo. ed.

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CHAP. V.

THE INTERMIXTURE OF CONTINGENT AND DEMONSTRATIVE REASONING.

It seems necessary, in order to complete our survey of the two great divisions of the subject, to advert more particularly to a circumstance already indicated in some of the examples introduced into the preceding exposition; viz. that demonstrative reasoning, even when non-syllogistic, is by no means confined to mathematics or the science of quantity; but it is perpetually intermixed with contingent reasoning on matters of a moral or a physical nature.

This might be exemplified by a thousand instances in common life. Take, for example, the course pursued by an advocate in defending his client from a criminal accusation. If he relies, as he is sometimes compelled to do, upon testimony to his client's character, the argument is purely contingent: he attempts to establish the moral excellence of the man, and then infers that a person of such estimable qualities would not be likely to commit the offence of which he is accused. But if, instead of this, he endeavours to prove an *alibi*, the logical procedure is altered. The crime (we will suppose) was committed in London, and he

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produces several credible witnesses who swear, that at the very moment when the deed was perpetrated, they saw the accused in Edinburgh. In this hypothetical case, the reasoning of the defence is mixed. When from the number, and respectability, and concurrence of the witnesses the advocate infers that their testimony is true, he employs a contingent argument; but when he proceeds further, and concludes from the attested fact of his client's being in Edinburgh that he could not have committed a crime at the same moment in London, this step in the reasoning is demonstrative.

We may observe a similar intermixture of reasoning on very various occasions, and, amongst the rest, on the common occasion of making indirect comparisons between objects and qualities of all kinds.

If two substances, for example, which could not be brought into juxtaposition, are attested to have been successively compared with a third substance and found to be respectively of the same colour with it, we conclude that they agree in colour with each other.

In this case, while the inference that the two mutually unapproachable substances are each of the same colour with the third (resting as it does on testimony) is contingent, the conclusion that therefore the two former substances resemble each other in colour, is necessary. A demonstrated conclusion, however, from a premise which has been obtained by contingent reasoning, must itself

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participate in the uncertainty of the premise. A chain (as some one has well observed in elucidation of this point) may be composed of both strong and weak links, but its strength, as a chain, can never be greater than that of the weakest link in it.

The way in which even strictly mathematical reasoning — reasoning about quantity — occurs in treating of matters of fact is familiar to the students of natural science, and may be illustrated by a short passage from a physiological writer whose arguments are frequently close and cogent.

"In the young of the carnivora," he says, "the weight [of the body] does not remain unchanged; on the contrary it increases from day to day by an appreciable quantity. This fact presupposes that the assimilative process in the young animal is more energetic, more intense, than the process of transformation in the existing tissues. If both processes were equally active, the weight of the body could not increase; and were the waste by transformation greater, the weight of the body would decrease." *

This is obviously a strict demonstrative argument. We see intuitively that if the body gains weight, more matter must be added to it than is subtracted from it.

* Animal Chemistry, by Justus Liebig, edited by Dr. Gregory, p. 67.

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To these examples of the intermixture of one species of reasoning with another, may be added the frequent introduction into argumentative discourse of other demonstrative enthymemes such as I have described in the third chapter, and for instances of which the reader may consult the Appendix.*

It may be remarked further, that the several varieties of demonstrative reasoning, as distinguished by the general principles which they exemplify, are to be found intermingled both with contingent reasoning and with each other. In geometry, as it is almost needless to mention except to recall the fact to the mind of the reader, we often find that in the demonstration of a single theorem, two or three different axioms are successively exemplified.

* Article, No. 1. Examination of a passage from Burke.

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CHAP. VI.

PRINCIPLES OF REASONING OR MAXIMS, AND ESPECIALLY THE DICTUM OF ARISTOTLE.

ALTHOUGH in the preceding chapters it was impossible not to touch incidentally on the place which axioms hold in reasoning, or rather in relation to it, yet, on account of the erroneous notions still prevalent in regard to them, notwithstanding what has been said by Locke in his chapter on maxims, and by Stewart in the 2d volume of his Philosophy, it may be useful to renew and extend the discussion of the subject. It will not be requisite to take into express consideration at the same time the analogous general principles of contingent reasoning, because any deficiency in my previous explanation of their character will be supplied by many of the following remarks, which *mutatis mutandis* will apply to them.

In demonstrative reasoning maxims or axioms are nothing more or less than self-evident general propositions formed from particular arguments, and every instance of demonstration may be ranged under some one or other of them as exemplifying it. If we take a few of the implying and implied facts adduced in the last chapter, this will be sufficiently manifest.

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Arguments.	*General Principle or Maxim.*
Implying fact: The lines A and B are severally equal to C. Implied fact: The lines A and B are equal to each other.	Things equal to the same thing are equal to each other.
Implying fact: Juvenis was in Edinburgh at noon on the day named. Implied fact: He could not be guilty of an offence committed on that day and at that hour in London.	A man cannot be in two places at the same time.
Implying fact: The angles ABD and ABC are together equal to the angles ABD and ABE. Implied fact: The angle ABC is equal to the angle ABE.	If equals are taken from equals, the remainders are equal.

Here it is obvious the maxims are only generalisations of the particular arguments, or of the particular instances of implication; and the self-evidence of both maxims and arguments is on a level, although the priority in respect of origin is with the latter.

In reference to these general principles or maxims, a variety of phrases are employed: thus, by some philosophers an argument is said to proceed on a certain general principle; by others, to be an application of it, to rest or to be founded upon it. The general principle itself is affirmed to be implied in the argument, to be involved in it, to be essential to it; while the conclusion is asserted to be dependent on the general principle, or to be proved by it or in virtue of it. These different expressions, when they are not posi-

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tively erroneous, fail to describe with precision the real place occupied by these maxims in relation to the reasoning process. They can have, nevertheless, only one legitimate meaning. The correct and most precise mode of stating the matter is to say, in respect of any particular argument, that it is an exemplification of a certain general principle or maxim; and in respect of the general principle, that it is exemplified in the particular argument, or is a generalisation of it, or may be educed from it.

The phraseology which implies that a conclusion is proved by any of these maxims, or in virtue of them, or is dependent upon them for its validity, is especially objectionable. In each of the instances of implication quoted above, the second fact or proposition is intuitively discerned to be implied in the first, as soon as both are viewed together; and this discernment of the particular truth is not at all dependent on the general maxim, which is, indeed, logically the result of subsequent discernment. It would be more correct to say that the general principle is deduced from the particular truth, than, conversely, that the particular truth is deduced from the general principle.

The latter statement is, indeed, wholly erroneous. These maxims have no probative force; they add no cogency to any argument; the conclusion does not at all depend upon them: they merely present the particular argument in a generalised form; a form which can be reached only through the particular

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argument which may happen to be before us, or another similar to it.

Speaking of such self-evident truths, Locke remarks, "they are known in particular instances before these general maxims are ever thought on, and draw all their force from the discernment of the mind employed about particular ideas."*

Mr. Stewart, who concurred in this view with the illustrious author of the Essay on Human Understanding, gives the following lucid exposition of his doctrine.

"It was long ago remarked by Locke, of the axioms of geometry as stated by Euclid, that although the proposition be at first enunciated in *general* terms, and afterwards appealed to, in its *particular* applications, as a principle *previously* examined and admitted, yet that the truth is not less evident in the latter case than in the former. He observes further that it is in some of its particular applications, that the truth of every axiom is originally perceived by the mind; and, therefore, that the general proposition, so far from being the *ground* of our assent to the truths which it comprehends, is only a verbal generalisation of what, in particular instances, has been already acknowledged as true." †

* On the Understanding, book iv. chap. vii. § 4.

† Elements of the Philosophy of the Human Mind, vol. ii. p. 29. 2d ed.

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Another writer, eminent both as a mathematician and a philosopher, I mean D'Alembert, gives his sanction to the same view, and remarks, that so far are axioms from holding the first rank in philosophy, that there is no necessity even to enunciate them. He afterwards terms them barren and puerile truths.*

Taking with us these considerations regarding the value and position of self-evident maxims, let us turn to the celebrated dictum of Aristotle.

The *dictum de omni et nullo*, viz. that "whatever is predicated universally of any class of things, may be predicated in like manner of any thing comprehended in that class," is not only stated by logicians to be a general maxim, of the application of which every direct syllogism is a particular instance, but proclaimed to be the universal principle of reasoning.

If we closely scrutinise the meaning of this maxim, undazzled by the somewhat magnificent and imposing phraseology in which it has been spoken of, we shall find it an obviously simple and undeniable proposition, namely, whatever is asserted of a class may be asserted of any species or individual of that class. A class, however, we must bear in mind, is not a collective or corporate whole, which, as a whole, possesses pro-

* Elémens de Philosophie, chap. iv.; also Discours Préliminaire de l'Encyclopédie.

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perties or attributes different from those of the individuals composing it; but what is predicated of it is predicated of every separate individual ranked under it. The proposition "all men are fallible" affirms that every individual man is fallible, while the proposition "the army is large" affirms of the body collectively something which it does not affirm of any single individual in it. If a class were such a collective body, the Aristotelian maxim could not be true.*

The dictum, therefore, it is plain, means neither more nor less than that whatever is predicated of *every* individual of a class may be predicated of *any* individual, or any number of individuals of that class. As, however, what can be truly predicated of any thing must be a property or attribute actually possessed, we may, if we choose, leave out predication altogether, and then the maxim will appear in a still simpler shape, as follows: What belongs to every individual of a class must belong to any individual of that class. However it may be expressed, it is obviously a self-evident and indisputable truth, like the other maxims we have just been considering; and this

* Lord Kames was sharply taken up by Dr. Gillies for having blundered on this point, he having represented the dictum to be, "Whatever is true of a number of particulars joined together, holds true of every one separately." — See ARISTOTLE'S *Ethics and Politics*, translated by John Gillies, LL.D., vol. i. p. 76.

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view of its co-ordinate character is sufficient of itself to determine the accuracy of the doctrine which proclaims it as the universal principle of reasoning.

To this point I must draw the reader's particular attention, for here lies the grand error of the Aristotelian theory; and it is really astonishing that a mistake of such magnitude should have been so implicitly admitted.

If the doctrine were true, every act of reasoning would be an exemplification of this one maxim, and might be ranged under it: in other words, all reasoning without exception would consist in concluding that an attribute belongs to some individual of a class*, because it belongs to every individual of that class. No other reason, according to this theory, can possibly exist or be assigned. The sole ground on which we can argue that an individual thing possesses any attribute is, that the thing belongs to a class all the members of which possess the attribute. The only kind of implication possible consists in generic facts implying individual facts.

In contradiction to all this, it has been shown above, that there are many other general principles or maxims of which particular acts of reasoning are exemplifications; such as, "things equal to

* Or is excluded from it. I have thought it needless to take into separate consideration the *de nullo* part of the maxim, as it would lead only to repetitions: negative propositions may, as Mr. Walker says, be considered at pleasure as affirmative.

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the same thing are equal to each other;" "a body cannot be in two places at one time;" "if equals are taken from equals the remainders are equal." When I affirm that two things, A and B, are equal to each other because they are severally equal to C, or that a man could not commit a crime at a specified time in London because he was at that precise moment in Edinburgh, I reason just as much as I do when I affirm that this man is fallible because all men are fallible, or that the three angles of the triangle before me are together equal to two right angles, because the three angles of every triangle are equal to two right angles.

The dictum, then, is obviously one of those self-evident maxims which we have above described, and it may be exhibited in the same manner.

Arguments.	*General Principle.*
Implying fact: All horned animals are ruminant.	Whatever is predicated of a class may be predicated of any individual of that class.
Implied fact: This horned animal is ruminant.	
Implying fact: The three angles of every triangle are together equal to two right angles.	The same.
Implied fact: The angles of this triangle are together equal to two right angles.	

If we compare these instances of one fact or proposition implying another with the others already referred to, we shall at once discern the true place and value of this renowned maxim; we

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shall see that the *dictum de omni et nullo* is a correct expression of the general principle on which *some* acts of reasoning proceed, or, in more correct language, which they exemplify; but that, in this respect, it is only on a level with other maxims, such as have been cited.

It may possibly be alleged, that at any rate one of the instances cited above as exemplifying another maxim may be ranged under the dictum of Aristotle. Drawn out at full length (it may be said) the argument in question is as follows:

All things equal to the same thing are equal to each other;
A and B are equal to the same thing C,
Therefore they are equal to each other.

Here, it may be urged, A and B are argued to be equal to each other, because they belong to the class of things which are equal to the same thing; but, as I shall have occasion to show again when treating of the syllogism, it is not *because* they belong to any class that we conclude them to be equal, but it is on account of the particular fact of their being respectively equal to C. Strike out all reference to a class, expunge the whole of the major premise, chain down the mind to this single instance of equality, and still the reasoning is complete, and the conclusion remains perfectly undisturbed. This argument, consequently, is no exemplification of the scholastic maxim. It shows conclusively that ratiocination is not so limited

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and insignificant as to consist in nothing else than concluding an attribute to belong to an individual, because it belongs universally to the class of which that individual is a member.* Reason refuses to be tethered to the stake of the dictum.

Logicians themselves, moreover, admit (some of them at least), that the *dictum de omni et nullo* is not intended or adduced to prove the force of syllogistic reasoning, for that would be attempting to demonstrate the validity of demonstration; but it is to be considered merely as a generalised statement of all demonstration whatever. In a manner quite analogous, the maxim which appears as the major premise in the above syllogism, viz. "all things equal to the same thing are equal to each other," is to be considered as a generalised statement of the particular demonstration that A and B, being equal to the same thing C, are equal to each other, and of all like cases; nor can it be adduced, any more than the Aristotelian maxim, to enforce an argument already perfectly conclusive.

To show the parity of the two cases, we may compel the dictum itself to serve as the major pre-

* That I do not here misrepresent the contracted scope assigned to reasoning by the scholastic logic is shown in the following extract from an able little work on the subject by Dr. Whately: "Now to *remind* one, on each occasion, that so and so is referable to such and such a class, and that the class which happens to be before us comprehends such and such things, — this, is *precisely all that is ever accomplished by reasoning*.' — *Easy Lessons on Reasoning*. The italics are Dr. Whately's.

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mise of an argument just as easily as we can force the mathematical axiom to perform that office, and we shall find that, when so impressed into the service, it will be equally inefficient.

What can be predicated of a class may be predicated of any individual of the class;
Mortality can be predicated of the class "men;"
Therefore mortality may be predicated of the individual man Peter.

To the conclusiveness of this argument, logicians must admit, in accordance with their own doctrine, that the dictum (major premiss, though it is) lends no force or cogency whatever.

But what I have now alleged to show the limited sphere of this celebrated maxim is not all.

So far is the *dictum de omni et nullo* from having any claim to be regarded as the sole principle of reasoning, that it cannot be correctly considered as the sole principle even of syllogistic reasoning; and this I think is implied in the very doctrines of logicians themselves; for, while they proclaim the *dictum* to be the universal principle, they admit that it is not directly applicable to any syllogisms but such as can be ranged under the four moods of the first figure.

Now, when it is said that a principle or maxim is not applicable, or even not directly applicable, to a syllogism, it is equivalent to saying that it cannot be educed or drawn from the syllogism, or

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that the syllogism does not exemplify the maxim, or proceed upon it.

To acknowledge, therefore, that the *dictum* cannot be directly applied to the syllogisms of the three other logical figures, is to admit that it is not the universal principle even of syllogistic reasoning.

And this is the true state of the case. The dictum is the principle, or the pair of principles, exemplified by syllogisms in the first figure, but not by any others. Each figure exemplifies principles of its own, allied to the dictum, but perfectly distinct from it.

There can be no act of demonstrative reasoning from which a self-evident maxim cannot be drawn; and as the kinds of syllogism selected and arranged under the figures and moods are all admitted to be demonstrative, each kind must be capable of yielding its maxim: in other words, from each kind a general principle self-evidently true may be educed.

Accordingly we find that the syllogisms in the second figure exemplify a pair of maxims allied to the dictum, but still distinct from it; viz. "When the whole of a class possess a certain attribute, whatever does not possess the attribute does not belong to the class," and "when the whole of a class is excluded from the possession of an attribute, whatever possesses the attribute does not belong to the class."

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Analogous maxims may be educed from syllogisms in the third and fourth figures, from each of which a single example will probably be thought enough.

The maxim for the moods *Darapti* and *Datisi* in the third figure is as follows:

"When the whole of a class possess a certain attribute, and the whole or part of the class possess another attribute, then some things that possess one possess the other."

And the following is the maxim for the moods *Bramantip* and *Dimaris* in the fourth figure.

"When the whole or part of a class possess an attribute, and all things which possess that attribute possess a second, then some which possess the second belong to the class." *

The preceding maxims, except the pair drawn from the second figure, which are clear enough, are not, it may be allowed, so plain, or so readily

* When I drew out the above maxims from the second, third, and fourth figures, I was not aware that something of the same kind had been previously done by Lambert, a German author, with whose treatise I am not fortunate enough to be acquainted. The reader who wishes to see the maxims as drawn out by him, will find them quoted in Mr. Mansel's edition of Aldrich, p. 73. and 80. Neither was it present to my mind, that, at a much earlier period, the principles of the second and third figures had been given in the Port Royal Art of Thinking. Had these been before me sooner, I should not have been at the trouble of producing mine. As it is, I let the maxims stand in their original forms, which differ in detail from those of my predecessors.

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comprehended, as the *dictum de omni et nullo;* but this arises from the arguments themselves being less simple; whence the several parts of each maxim are not so easily kept in view together; for as soon as the terms in which they are expressed are understood and their meanings simultaneously viewed, they are seen to be self-evidently true. Being nevertheless educed from particular arguments which are equally true and more immediately evident, they can neither give light nor lend force to the syllogisms from which they are drawn. In brief, they are altogether useless.

In these and other respects they are on a level with the dictum of Aristotle; and, although allied to that dictum, they are distinct and true in themselves without reference to any thing else.

The principle that a thing possesses a certain attribute when all the class to which it belongs possess it, is plainly different from the principle that a thing does not belong to a class when it does not possess an attribute common to the class.

Between these two maxims there is as clear a distinction as between the axiom that two quantities are equal to each other when they are respectively equal to a third quantity, and the maxim that two quantities are equal to each other, when they are the remainders of two equal quantities from each of which the same quantity has been taken. They are allied but not identical maxims.

It results from this examination, that the *dic-*

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tum de omni et nullo, is very far from having any claim to be considered as the universal principle of reasoning; for, to say nothing of its not being the principle of direct contingent reasoning, it has been here shown,

1. That it is only one of the principles of demonstrative reasoning, co-ordinate with many others, and
2. That it is not even the sole principle of syllogistic reasoning, but only of those syllogisms which conform to the first figure.

Before concluding, it may be useful to advert to the importance of distinguishing between such self-evident general principles or maxims as have here been considered, and those general propositions regarding objects and events which are the results of observation: nor is it superfluous after the previous explanations to discriminate and contrast them. The maxims in question are self-evident; their truth is discerned as soon as they are understood, and denying them is seen to involve a contradiction. On the other hand, a general proposition formed from observing a number of facts, although it may be quite convincing, depends for that quality on the facts observed, and it may be called in question without inconsistence or absurdity. The self-evident maxim cannot be used as a proof, because the argument which it might be employed to confirm is equally self-evident; while the general proposition obtained from the observa-

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tion of facts, so far from being an ineffective generalisation, either constitutes or represents the whole proof of the particular conclusion sought to be established. The same remarks will apply, *mutatis mutandis*, to general theorems obtained by deduction from incontrovertible premises: having been first demonstrated themselves, they subsequently form the real proofs of particular conclusions.

A brief notice may also be usefully bestowed on some observations, in reference to the present subject, which appear to have originated in a wrong apprehension of what maxims are.

It has been alleged as an objection by some writers, that the *dictum de omni et nullo* is a principle of no great depth, and by others that it is a self-evident proposition, little better than a mere truism — allegations clearly well founded; but it is not so clear how they are meant to be applied, or what they are intended to enforce or to illustrate.

All the maxims of which acts of demonstrative reasoning are exemplifications, must, from the very nature of the case, be self-evident propositions, and, consequently, may be affirmed to be of no great depth. Such acts of reasoning could not be demonstrative, if self-evident maxims were not educible from them. To allege this self-evidence as a fault or objection, is consequently to mistake the

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position and value of the maxims which it characterises.

In treating the dictum of Aristotle separately, it has been impossible to avoid repeating what has been already said, and forestalling some explanations which will find their fitting places in a subsequent chapter; but the erroneous light in which logicians have continued even down to our own times to view this celebrated maxim, seemed to call for a particular examination of its true character and position.

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CHAP. VII.

FORMS OF REASONING, AND ESPECIALLY THE SYLLOGISM.

No doctrine is more clearly and unequivocally maintained by logicians, than the sameness, in all cases, of the reasoning process, whatever the subject-matter of the argument may be. And if the *dictum de omni et nullo* truly represented what, in all cases, constitutes reasoning, and were the only principle on which, according to common phraseology, that operation proceeds, the doctrine would be undeniable.

But, in the first place, if the account already given is accurate, there are at least two processes of which reasoning is the common name, broadly distinguished from each other; distinct in the nature of the proofs adduced, distinct in the principles exemplified, and distinct in the state of mind resulting.

In the second place, if we confine our attention merely to demonstrative reasoning, and look at the general principles on which that species of reasoning proceeds, we find, as shown in the two last chapters, that they are numerous; that the *dictum de omni et nullo* is only one amongst the set; and, if the number of such axioms or principles is to

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be the criterion, demonstrative reasoning must be pronounced multiplex. If we call it one *species* of reasoning, the varieties under this species must be formed by a reference to the general principle of which each act of reasoning is an exemplification, or, in other words, on which it proceeds.

Besides the doctrine that reasoning is one and the same process in all cases, or as a part or sequel of the doctrine, it is further contended, that all reasoning may be thrown into the form of three propositions; that every conclusion is really deduced from two other propositions; and that the syllogism which contains the three exhibits a correct analysis or representation of the one identical process.*

What has been already said in the foregoing chapters supplies, in some measure, a refutation of the substantial portion of these assertions; but it may be useful to enter into a more minute consideration of the errors comprised in them.

With regard to the forms in which reasoning may be exhibited, it has been shown, in the two last chapters, that what I have ventured to term direct contingent reasoning may be expressed in two ways, or rather assumes two different forms.

The type of one is,

* Thus, in the Port Royal Logic it is said, "No enthymeme is conclusive, save in virtue of a proposition understood, which, consequently, ought to be in the mind though it be not expressed." Part iii. chap. ix.

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All men as far as observation has extended have been fallible;
Therefore this man [whose fallibility has not been matter of observation] is fallible.

The type of the other is,

All men as far as observation has extended have been fallible;
Therefore all men *are* fallible.

In reasoning of this description the strict demonstrative syllogism can obviously have no place.

We may, indeed, vary the first type by introducing a minor premise, and thus throw the argument into three propositions; but we should, in this way, obtain only a quasi-syllogism, not a real or demonstrative one. In the case of the second type, even this is impracticable, although even here we may construct a somewhat different quasi-syllogism by generalising the argument into "what all men have been all men are," and introducing the general proposition or maxim so created as a major premise; a procedure which, as I have already shown in part, and shall hereafter show more fully, is vain and nugatory.

When, indeed, we have once legitimately inferred a general law, and employ it as a major premise, from which to deduce particular inferences, contingent reasoning falls into class-reasoning, and becomes in form demonstrative, without however acquiring any additional force from its new shape.

The assertion then above quoted, that all reason-

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ing may be thrown into syllogisms is not true of direct contingent reasoning.

We turn then to demonstrative reasoning, and inquire whether this is all syllogistic; whether every conclusion in demonstrative reasoning is really deduced from two other propositions called respectively the major and the minor premise; and whether consequently the syllogism can be regarded as a true analysis or correct representation of the process in every instance.

When it is affirmed that every conclusion is really deduced from two other propositions, the assertion, if it means any thing, must mean either that when any person draws an inference he has two other propositions in his mind, or that two other propositions are requisite to make the inference valid; but, for my own part, I find myself continually drawing inferences from facts which if expressed in language at all may be fully expressed in a single proposition, and I am not able to discover that such inferences can be rendered more valid by adding another proposition to it. It will not, I think, be difficult to show that in two distinct cases, we have in our minds only one fact, or one set of facts, expressible in a single proposition, on which the inference depends; that, in the one case, there is nothing in the mind corresponding to the minor premise of a syllogism, and, in the other, nothing corresponding to the major premise, and that in both cases the single premise suffices for the validity of the conclusion.

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Hence, if there were no other objections to the doctrine, the syllogism could not be regarded as a correct representation or analysis of every intellectual process termed reasoning.

In regard to the first point, it will not require much skill to show that what is termed the minor premise is so far from being essentially necessary to a perfect process of reasoning, that, in certain cases, it cannot be forced into the verbal expression or representation of that process without puerility or supererogation; and when it is thus forcibly introduced, it adds no strength to the conclusion, and there is really nothing in the process to which it corresponds.

Let us take a familiar instance before employed. A naturalist finds the remains of a horned quadruped, and pronounces that it was a ruminant animal. The reasoning here, if considered as class-reasoning, is perfectly expressed by a single premise with the conclusion.

All horned quadrupeds are ruminant;
Therefore this horned quadruped was ruminant.

A logician may say, "Yes; but you here comprise in the conclusion two facts or propositions; and, when these are separated, you obtain a regular syllogism.

All horned quadrupeds are ruminant;
This quadruped had horns;
Therefore it was ruminant."

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The introduction of a separate proposition, nevertheless, is obviously forced; it adds no strength to the inference, and represents no separate mental operation. The naturalist sees before him at a glance the remains of a horned quadruped; and he believes it to have been ruminant because he knows that these attributes have been always found conjoined. In relation to the fact before his eyes, this knowledge enables him to draw an immediate inference. You may say that it is a compound fact, and you may decompose it into the two facts of the animal having four legs and having two horns; and then contend that these were joined together by a distinct mental act corresponding to the minor premise. But all this is pure invention of what no one is conscious of, as will be manifest, if we strip the instance of some of its accessories. Suppose the naturalist to find only the horns, and to infer that the animal they belonged to was ruminant. The whole of what passed in his mind would be represented in two propositions: "All animals having such horns as these are ruminant; therefore the animal to which these horns belonged was ruminant."

If you attempt to introduce a minor premise, you fall into the identical proposition, "The animal to which these horns belonged had such horns." Or, take the trite argument, that Peter is fallible because he is a man, and all men are fallible.

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The following enthymeme is surely as cogent and complete:

This man is fallible
Because all men are fallible.

In order to make this into a syllogism, you must again resort to a mere identical proposition.

All men are fallible;
This man is a man;
Therefore this man is fallible.

In what way can such an excrescence as the minor premise here lend any force or clearness to the inference, or be considered an indispensable step? It seems to me indeed strange, and almost ludicrous, to maintain that you cannot draw an inference from the visible or notorious qualities of an object without a separate mental act, silently pronouncing that such qualities do really belong to the object; that, in the example cited, you are not capable of concluding the man before you to be fallible, until you have passed through the intellectual operation (if it can be so called) represented by the identical proposition "this man is a man;" or until the discovery that his name is Peter has relieved you from the awkwardness of exemplifying the literal formula $a = a$.

It is obvious that the minor premise is needless or supererogatory, when the subject of the conclusion manifestly belongs to the class of which something is predicated in the major. The sole office of the minor, in syllogisms of this form, is to

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declare the subject of it to be one of the class; and when that circumstance is already as evident as it can be, such a declaration is not only superfluous, but impertinent.

It may be remarked, too, that the enthymeme above cited fully corresponds to the *dictum de omni et nullo*, "What is predicated of a whole class may be predicated of any individual contained under it." The universal principle of reasoning, as it has been called, forgets the minor premise, and is perfectly exemplified by enthymemes which omit it. The argument, "Fallibility may be predicated of all men; therefore it may be predicated of this man," is a complete exemplification of the dictum. Even all class-reasoning, then, is not syllogistic.

In regard to the second point which I have undertaken to establish, and which is of much greater importance than the other, a brief exposition (only repeating, indeed, what has been said before) will suffice to show that a perfect piece of reasoning may consist of what is usually called the minor premise with the conclusion, and without any major premise. This is true of certain cases of demonstrative reasoning, as explained in the preceding chapter. Take once more the simple instance, the lines A and B are equal to each other; for they are severally equal to C.

Here the reasoning is complete. You may indeed form a general proposition, and make it into a major premise, as was shown in the chapter

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just referred to. You may enunciate, that things equal to the same thing are equal to each other; A and B are equal to the same thing C; therefore they are equal to each other.

This general proposition, however, is psychologically an after-thought. It may not enter the mind at all; and, what is most important, it adds nothing to the force of the argument. The reasoner discerns the truth of the conclusion from the particular fact expressed in what is termed the minor premise; and, after so discerning it, may or may not proceed to discern that the assertion will hold good in all cases. The latter is, as already explained, the general principle exemplified by the argument, or educed from it, and cannot constitute a part of it.*

The procedure of the mind would, in truth, be more accurately represented as follows than in the syllogism above cited.

A and B are respectively equal to C;
Therefore they are equal to each other:
And it is also manifest, that a similar conclusion may be drawn as to the mutual equality of all things which are equal to the same thing.

* This point is forcibly urged in the sequel to Sematology (p. 112) by Mr. Smart, whose writings abound with acute and often just observations on logic, beyond those of most living authors. I may be permitted, however, to add that in some of his views and modes of representing logical subjects I am not able to concur.

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Thus there is an extensive set of cases of demonstrative reasoning, which do not come under the head of class-reasoning, and which find a perfect expression in the shape of enthymemes. To attempt to force them into the syllogistic form is to mistake their character, and the circumstances on which their cogency depends. It is surprising that geometrical reasoning should ever have been considered as altogether syllogistic when fully spread out; for, although all its steps are susceptible of being thrown into that form, it can be done in the case of many of them only by the introduction of self-evident axioms, of which they are perfectly independent for their force, and which are consequently a useless appendage.

I have borrowed my illustration from mathematical reasoning; but the same superfluous or excrescent character of the major premise may be observed in certain cases of reasoning on moral and physical subjects. Revert, in proof of this, to the instances of demonstrative reasoning cited in the third chapter. One of them will suffice here for illustration: "The planets are opaque bodies; therefore they must shine by light derived from an external source." It is obvious that a proposition affirming that all opaque bodies shine by light derived from external sources, would be merely generalising an argument sufficiently conclusive, and would not add to it a particle of cogency.

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The class of demonstrative inferences before pointed out, in which the premise and the conclusion differ only in presenting the same fact under two several aspects, likewise require no major proposition; as, "This man is enslaved by his appetites; therefore he is not free:" where the reasoning, which appears puerile enough already, would be rendered still more so by prefixing the general assertion, "No man who is enslaved by his appetites is free." *

The same may be said of those inferences which take place in the conversion of propositions: *e. g.*,

No man is infallible;

Therefore no infallible being is a man.

In a former chapter I remarked that all instances of conversion are really instances of demonstrative reasoning, being pure enthymemes which require no major premises. That the latter may be supplied, and that, when supplied, they are perfectly inefficient in adding strength to the argument, and therefore wholly superfluous, may be easily shown.

Let us try this experiment on the instance of conversion just cited. It may be transformed into the following syllogism:

When a class are excluded from an attribute,
all beings who possess that attribute are excluded from the class;

* This is, however, an actual syllogism given in the Elements of Logic.

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The class "men" are excluded from the attribute of infallibility;

Therefore all beings who possess infallibility are excluded from the class "men."

Here it is manifest that nothing is gained but a mass of verbiage by the introduction of a major premise. The enthymeme is equally cogent, and more readily seen to be so.

To elucidate the subject still further, let us take another demonstrative enthymeme:

The world exhibits marks of design;

Therefore it is the work of an intelligent author.

This argument, so expressed, is an example of necessary implication as much as if any one were to say, "This is a thought, therefore it must have proceeded from a thinker." In order to make it into a syllogism, we must prefix the general proposition, "Whatever exhibits marks of design has had an intelligent author;" but if any one does not discern the conclusion to be implied in the minor premise, he will not be convinced by the addition of the major, which can lend no force to the argument, being merely a generalisation of it.

The instances which I have hitherto adduced, all exhibit self-evident implication of one thing by another; but there are cases in which the asserted implication is not self-evident, and yet the reason-

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ing can gain no force from its being taken out of the form of an enthymeme.

Suppose any logician to assert that "Solon was a wise legislator," and on inquiring into the reason of his assertion, he answered, "Because he adapted his laws to the genius of the people." If I were not satisfied with this reason, and pushed my questioning further, "Why do you consider him as a wise legislator for doing this?" he, as a logician, might reply, "All legislators who do this are wise." Such a reply, nevertheless, would leave me just as I was. The reasoning, indeed, would be rounded into a perfect syllogism; the major premise would be supplied, and, if admitted at the outset, the conclusion must be admitted with it; but, starting from the conclusion as a proposition to be proved, I should be no more satisfied than I was before. If I were *not* convinced that Solon proved himself a wise legislator by adapting his laws to the genius of the people, I should not be satisfied by the major proposition; and if I *were* convinced, the major proposition would be needless, for the same reason in both cases, namely, that it would be nothing more than a generalisation of the particular argument.

It is not that such reasoning is self-evident, and the denial of its validity involves a contradiction; but that to generalise it into a major proposition does not add to its force. If you wish to strengthen it you must find something different from a major

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premise, as, for example, "For when laws are adapted to the genius of the people they are cheerfully obeyed."

In reference to such cases it is to be considered that to discern one fact to be implied in another requires a certain degree of knowledge. Where the subjects of the reasoning are simple, and the necessary knowledge is a common possession, the implication appears at once self-evident, as in geometry, which is concerned exclusively with lines and angles. But where the subjects of the reasoning are complex, one fact may be really implied in another, although the implication is not discernible without considerable knowledge and study. Whether the implication, however, is immediately self-evident or not, a general proposition in the form of a major premise is alike inoperative as a proof. It could be obtained only by generalising the particular argument, and general propositions so obtained are wholly inefficient and supererogatory in establishing the conclusion. When, on the other hand, they are obtained by collecting facts, or are the result of previous deduction, they are, as remarked in the last chapter, essentially necessary to the inference.

If we compare the instances last adduced with a syllogism or enthymeme which has for its major or only premise either a collective fact respecting a class of objects, or a law of nature deduced from such a fact, we shall find that, in the latter case

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the force of the argument is wholly dependent on the general proposition, or on the collective fact from which it has been deduced.

As an example, the old well-worn syllogism before cited will do as well as any other:

All men are mortal;
Peter is a man;
Therefore he is mortal.

Here the allegation that Peter is a man would constitute no sufficient ground for concluding him to be mortal; it merely brings him within the general fact or law which is the real reason. It is the latter that makes the argument good; the minor premise would be of non-effect without it.

But in the case of the enthymemes, and more conspicuously the mathematical demonstration before cited, the minor, or rather the only premise, suffices of itself, and can borrow no strength, as a reason, from the addition of the major; which being a mere generalisation of the argument after its cogency must have been seen, would be more properly termed a corollary than a premise.*

To sum up in reverse order what has been said of the forms of demonstrative reasoning:—

* In reference to the same argument, the author of Sematology observes, "In this instance the axiom which forms the major proposition is superfluous: it is not an inductive whole, like "Man is mortal," from which we deduce the more particular comprehended in it; but the particular, suppose it to occur to the mind for the first time, is as certainly understood to be true as if it came after millions of instances."—*Sequel to Sematology*, p. 112.

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In arguments where a particular fact implies another fact, or, to express it differently, where what is usually called the minor premise implies the conclusion, a general proposition or major premise is redundant; and such reasoning, so far from being syllogistic, cannot even be considered as class-reasoning at all, or as in anywise exemplifying the *dictum de omni et nullo* or other allied dicta. Of these acts of reasoning the geometrical enthymeme is the best type.

On the other hand, where the major premise or a general proposition implies the conclusion, a minor premise is sometimes needful and sometimes superfluous: — needful when the subject of the conclusion does not manifestly belong to the class designated by the middle term or spoken of in the major premise; superfluous when it manifestly does.

All such reasoning, whether with or without a minor premise, exemplifies the scholastic dictum or other dicta allied to it.

We are thus brought to the conclusion that in numerous cases of demonstrative reasoning, one premise is alone sufficient for the inference, although it may be granted that, even in those cases, it is possible to form a complete syllogism by thrusting in a fruitless and redundant proposition.

It follows, also, from what has been said, that it is inappropriate and incorrect to call the syllogism an analysis of the process of all demonstrative

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reasoning, and much more so to apply the assertion to all reasoning whatever.

An analysis of reasoning ought to be an account of what takes place in the mind when it draws an inference, or is determined to a conclusion. Now from the preceding representations, it is manifest that a single fact or combination of facts, capable of being expressed in one proposition, frequently determines the mind to a conclusion without reference to any thing else. This is the whole of which the mind is conscious, or which can be discerned as having taken place on reflection.

Supplying in such cases the missing premise, as it is called, when it is not introducing a mere identical assertion, is simply stating a certain proposition which may be enunciated with truth if the argument is valid, but which neither forms nor represents any part of the mental process. To contend that a second premise is necessary to the completion of an argument, because it may by some expedient or other always be added to it, is like contending that a shawl is an indispensable part of a lady's dress because it may always be thrown over every thing else in which she may be attired.

This introduction of two premises is in many arguments proper and needful, but in some it is mere impertinence or supererogation, and in others nothing more than the obtrusion of identical propositions.

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CHAP. VIII.

PRIMARY OR ORIGINAL PREMISES.

THE preceding chapters have endeavoured to show, amongst other things, that what are termed principles of reasoning, or maxims, give no force to arguments. They do not constitute real premises in any case, and cannot, therefore, be the original premises from which we set out.

What, then, it may be asked, are the primary propositions with which our reasonings commence?

To this inquiry, it may be at once replied, that, with the exceptions to be hereafter named, we always commence with particular facts; or, to express it more precisely, that particular facts, or propositions expressive of them, are, in every case, taking into view the whole train of reasoning from beginning to end, the first premises from which we start, and the ultimate ground at which, in tracing back our reasonings, we invariably arrive.

It has been said, indeed, in contrariety to this, that all our reasonings about events, if traced back to their origin, will be found to rest on the maxim or general principle, as a major premise, that similar causes produce similar effects, and that all our reasonings in mathematics rest in the same way on the several axioms of that science.

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But, as I have already shown, these general principles and axioms are educed from particular arguments or instances of implication; and, if this is true, they cannot precede such arguments, nor constitute the original premises from which any conclusions are inferred.

Nor can those general propositions which really form constituent parts of our reasonings, be the original premises inquired for.

In contingent reasoning, as already explained, it is from particular facts that we form or infer a general law; and, although we may subsequently use the general law as a premise from which to deduce particular conclusions, the whole reasoning rests on the first facts, and the general law is only an intermediate proposition.

In demonstrative reasoning the same position is equally true. At the outset it is always in one or more particular facts that we discern another particular fact to be implied; and it is from such particular implications that we form those general propositions which we use in subsequent deductions. From discerning an implication in one instance we discern that it must have place in all like instances. Hence neither axioms, nor general laws obtained by contingent reasoning, nor general propositions employed in demonstrative reasoning, can be primary or original premises.

I am here speaking, on the supposition of the whole of a train of reasoning being gone through

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by the same mind, or, to state the matter differently, I am speaking as if the whole race of thinkers constituted one individual.

Practically we take general propositions or laws from various sources without going back to their origin — from authority, or testimony, or hypothesis, — and reason from them without hesitation: and if such propositions are furnished to us from a source beyond which we cannot ascend, as, for example, by revelation from a superior intelligence, they are to mankind original major premises, and form exceptions to the doctrine that we always commence with particular facts.

Every man, indeed, is in a position analogous to this with regard to general laws on subjects which he has not himself investigated, inasmuch as his want of knowledge precludes him from ascending to the primary facts from which they are inferred.

Another source of general propositions not obtained from particular facts, and serving as original major premises, is to be found in civil laws, commands, directions, and rules of conduct generally. This is a most extensive source of premises, from which we deduce conclusions in practical life; and although it has obviously nothing to do with the acquisition of science, the reasoning is precisely on a level with that in which the premises are obtained by what logicians term complete enumeration, or by geometrical inference.

"If," says Mr. Stewart, "there are any parts of

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science in which the syllogism can be advantageously applied, it must be those where our judgments are formed in consequence of an application to particular cases of certain maxims [general propositions] which we are not at liberty to dispute. An example of this occurs in the practice of law. Here the particular conclusion must be regulated by the general principle, whether right or wrong. The case was similar in every branch of philosophy, as long as the authority of great names prevailed, and the old scholastic maxims were allowed, without examination, to pass as incontrovertible truths."*

The doctrine which so long predominated, and which still continues to be held by philosophers at large, that all our reasonings must be founded on general principles or propositions, or, in other words, that all our conclusions may be traced back

* Elements of Philosophy, vol. ii. p. 286. This case of general propositions being sometimes given to us, forming an exception to the doctrine that the original premises in our reasonings are particular facts, has also been well explained by Mr. John Mill in his System of Logic, vol. i. 260. Mr. Smart expresses the general doctrine of this chapter with clearness and precision. After remarking that in tracing back our inferences we must come at last to something not an inference, he continues: "Now this ultimate ground can consist of nothing but particular or individual truths, for which we have the evidence of our senses or our consciousness."—*Practical Logic*, p. 35. Locke (although the remark is made in a different connection) observes that "the immediate object of all our reason and knowledge is nothing but particulars."—*Essay*, book iv. chap. 17.

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to such propositions as primary or original premises, has at all times been a formidable obstruction to the progress of knowledge.

We can scarcely suppose that, if men had clearly seen the necessity of commencing their deductions with particular facts as first premises, they could have fallen into those false principles, which, as it was, they began by assuming.

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CHAP. IX.

THE RELATION BETWEEN REASONING AND LANGUAGE.

As all the acts of reasoning which men communicate to each other, and even many of those which are confined to their own breasts, are put into words, language cannot but stand in a very important relation to the reasoning process. So intimate, indeed, is the connection between them, that many logicians have maintained the impossibility of reasoning without words.

Although this is a doctrine which is obviously at variance with the whole tenour of the preceding views, and virtually refuted by some of the particular arguments employed to enforce them, yet, from its extensive prevalence, it seems to require a distinct examination; and this examination will probably bring out the true relation in which the two things before us stand to each other. The following is one of the most recent statements of the logical doctrine on the subject.

"Logic is entirely conversant about language," or "is wholly concerned in the use of language." Accordingly, a syllogism is "an argument so expressed, that the conclusiveness of it is manifest

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from the mere force of the expression, *i. e.* without considering the meaning of the terms."*

This doctrine, if we take its superficial import, seems to narrow the province of logic to only one kind of argumentation, by representing it as embracing only such reasoning as is carried on in words. It appears, at first sight, to be founded on a distinction between employing language in reasoning, and reasoning without language, and to restrict logic to the consideration of the former. Unexpressed reasoning, tacit deduction, which takes place independently of language, is not, arcording to this representation, within the domain of the science.

In this case, it would be necessary either to pass over the latter sort of inference altogether, or to treat it as something separate and distinct; but as reasoning, whether expressed in language or not, is really about things, such a distinction would be at the best illusory.

If the expressions, however, containing the doctrine, are looked at more closely, they will be found to imply a much more important proposition,

* The expressions between quotation marks are the words of Dr. Whately in his Elements of Logic, p. 56. 88. 1st ed. Dugald Stewart, in his zeal for nominalism, had previously given his sanction to the same view: see Elements of Philosophy, vol. i. p. 175, 176. 8vo. ed. In a subsequent passage, however, Mr. Stewart qualifies the doctrine, as will be hereafter explained.

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viz., that there is no reasoning except in words. They virtually declare the process to be impossible without language, and, moreover, to be so much an affair of mere words, that we can reason without attaching any meaning to the terms employed.

Let us examine these two extraordinary positions.

That the various operations of the mind are concerned with facts or things, has been already shown; and it is plain that we may think of facts and things — we may recollect, conceive, or imagine them, without the intervention of signs. Nor is language more necessary to the mental act called reasoning *, than it is to the operations called memory, conception, and imagination. All the help which it affords, in this process, is enabling the mind to recall and keep in view the facts represented by the signs employed.

The possibility of reasoning in geometry without words, cannot, I think, be doubted by any one who attends to the movements of his own mind.

* Even Hobbes, who has been styled *plusquam nominalis*, and who seems, in many passages of his writings, to regard reasoning, like truth, as an affair of mere words, now and then admits that we may carry on the process without them. He says, "Quomodo autem animo sine verbis tacitâ cogitatione ratiocinando addere et subtrahere solemus uno aut altero exemplo ostendendum est." "But how by the ratiocination of our mind we add and subtract in our silent thoughts, without the use of words, it will be necessary for me to make intelligible by an example or two."— *Logic*, chap. i. § 2. See also Leviathan, chap. v.

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In tracing the proofs that the three angles of a triangle are equal to two right angles, I can, for my own part, easily follow the steps of the demonstration without thinking about the language. I am led to discern intuitively the equality of certain angles to other angles, until I arrive at the conclusion; a discernment which has not the slightest concern with words, as I can go through the whole deduction without even attaching names or letters to the angles.*

So in contingent reasoning, or drawing conclusions about events. A great part of our reasoning consists in inferring the future from the past, the absent from the present, the unknown past from the known past. In all these cases what we think about are facts. We represent to ourselves the objects and events of which we have had knowledge or experience, and the future events which, from a review of these, we think will happen, or the unobserved past events, which we conclude have happened. Language may mingle in these operations, but it is neither essential to them nor forms their principal feature: it may mix itself with our

* Hobbes acknowledges the possibility of this: he says a man that hath no use of speech at all, such as is born and remains perfectly deaf and dumb, if he set before his eyes a triangle, and by it two right angles, such as are the corners of a square figure, he may, by meditation, compare and find that the three angles of that triangle are equal to those two right angles that stand by it." — *Leviathan*, part i. chap. iv.

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reasonings, as it does with our recollections and imaginings, without at all affecting their substantial character.*

It is, indeed, an extraordinary mistake to suppose that we reason only when we clothe our thoughts in words, or deduce our conclusions in verbal propositions. It surely requires little reflection to be aware that we every day make a thousand inferences with the rapidity of lightning, without the possibility of the intermediation of language. So far, indeed, are we from being obliged to reason in words, that I will venture to appeal to the consciousness of the reader whether we do not oftener reason without them. While performing our commonest actions we are perpetually making inferences, and cannot avoid it. In taking a walk, for instance, in choosing this road, in avoiding that obstacle, in mounting a style, or in opening a gate, we are constantly concluding beforehand what results will follow certain acts, without putting these anticipations into language. What rapid inferences are drawn by a popular orator who is making a speech to a wayward assembly, and has to adapt his matter and his expressions, as he proceeds, to the state of

* "To suppose," says Dr. Brown, "that we cannot reason without language, seems to me, indeed, almost to involve the same inconsistency, as to say, that man is incapable of moving his limbs till he have previously walked a mile."— *Lectures on the Human Mind*, vol. ii. p. 527.

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feeling which manifests itself to his observation! He shuns one topic which he intended to introduce because he becomes aware that it will be ill-received; and he introduces another not premeditated, because his tact enables him to foresee that it will make a favourable impression. And this instance is the more remarkable as an illustration of the view here taken, because a double process of reasoning is at one and the same time taking place in the mind. The orator not only reasons in words to his audience, but is conscious of a rapid series of tacit inferences going on within him as to what topics it will be proper to avoid or profitable to touch upon as he proceeds.

In some passages of his writings Dugald Stewart, quitting for a while the pure logical doctrine, takes a view of the subject similar to that here given. "We can employ," he says in one place, "the agency of air to increase the heat of a furnace; the furnace to render iron malleable; and [*we can apply*] the iron to all the various purposes of the mechanical arts. Now it appears to me that all this may be conceived and done without the aid of language; and yet, assuredly, to discover a series of means subservient to a particular end, or, in other words, an effort of mechanical invention, implies, according to the common doctrines of philosophers, the exercise of our reasoning powers. In this sense, therefore, of the word reasoning, I am inclined to think that it is not essentially con-

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nected with the faculty of generalisation, nor with the use of signs." *

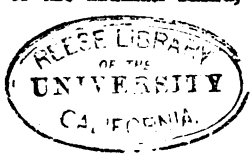
But Mr. Stewart, it must be observed, terms all this particular reasoning. He allows, with Hobbes, that particular reasoning may take place without words; but general reasoning, he affirms (and here he again falls in with the logical doctrine), cannot take place except in words.

He goes even to the extreme nominalism of asserting, that without the use of signs all our thoughts must have related to individuals, forgetting that since a sign must signify something, if we could think only of individuals, signs of individuals would be the only signs that could be invented. Discerning or thinking of a class, *i. e.* a number of individuals resembling each other in one or more respects, must precede the act of naming a class, otherwise we should be giving a name to nothing.

The example which Mr. Stewart himself adduces is sufficient to show the error of his doctrine.

If a man reasons without language when he employs the agency of air to increase the heat of a furnace, which he may do, although completely deaf and dumb, he has already generalised. When he has sent one blast of air into his fire, he sends another after it, in the full assurance that he can

* Elements of the Philosophy of the Human Mind, vol. i. p. 207. 8vo. ed.



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produce the same effect whenever he chooses; and he infers, with as little doubt, that his neighbour, who is building another furnace, will find currents of air equally efficient.*

If this is not generalising and general reasoning, what is? It may possibly be alleged, however, although incorrectly, that what I have hitherto advanced cannot be applied to syllogistic reasoning. Let us consider, then, a case expressly of this description. Let us suppose our deaf and dumb man to be something of a botanist, and to be taking a country walk. He comes to a bank on which are growing a number of primroses, and, on examining the flowers, he perceives, as he has always perceived in similar examinations, that each flower contains five filaments or stamens. He proceeds in his walk, and sees another prim-

* Condillac has been classed amongst those who have considered language as indispensable to reasoning; and he undoubtedly asserts that the art of reasoning resolves itself into a well constructed language. "L'art de raisonner se réduit à une langue bien faite," or "à l'art de bien parler."—*La Logique*, partie ii. chap. v. And in another part of the same treatise, he tells us, "que les mots nous sont absolument nécessaires pour nous faire des idées de toutes espéces; et nous verrons bientôt que les idées abstraites et générales ne sont que des dénominations. Tout confirmera donc *que nous ne pensons qu'avec le secours des mots.*"—Partie ii. chap. v. The last doctrine goes even beyond that of Mr. Stewart. There are however, other passages in the same treatise not easy to reconcile with those I have quoted (see partie i. chap. vii. and partie ii. chap. i.); so difficult is it to be consistent in error.

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rose growing on an inaccessible ledge, half-way down a perpendicular rock, and "not to be come at by the willing hand." Although inspection of the flower is precluded, reasoning about it is not, and he immediately infers that it has five stamens in its corolla, like all which he has examined. In this case he would think and infer, without the slightest aid from language, just what a syllogism expresses. Surely the power of attaching the generic name of primrose to the flower could not possibly make it a clearer act of reasoning.

We have next to consider the assertion, that the conclusiveness of an argument may be manifest from the mere force of the expression, without considering the meaning of its terms.

To employ language in reasoning, without attaching some meaning to the signs employed, seems to me, I confess, a sheer impossibility; and there is, to my understanding, a marvellous inconsistency in saying, that the conclusiveness of an argument may be manifest from the mere force of the expression, without considering the meaning of the terms. Expression can have no force but from its meaning. Language, in so far as it has no meaning, has no strength: it is a mere noise, a nullity.

The writers who thus maintain that the conclusiveness of a properly expressed argument is manifest without considering the meaning of the terms, exemplify their doctrine as follows: — "In

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this syllogism Y is X, Z is Y, therefore Z is X, the conclusion is inevitable, whatever terms X Y Z respectively are understood to stand for." Here is an admission, at all events, that they must stand for something; and it is precisely what they stand for that constitutes their meaning, and that gives force and even intelligibility to the argument. If the letters are to be considered as mere letters without representative power or symbolical significance, each proposition of the syllogism is false. The letter Y is not the letter X, nor is the letter Z the letter Y. We must, then, of necessity, consider the representative meaning. Y must be taken to designate some thing or things, and not to stand as a mere letter; X must be taken to designate some attribute of Y; and Z must be taken as meaning Y, or as a particular name for a thing also called Y. The conclusion asserts that Z must therefore have the attribute belonging to the thing or things called Y.

Here, then, it is manifest, that the meaning is everything to the argument. The letters are merely helps.

That a variety of things and attributes may be attached to the symbols X, Y, Z, without altering the force of the argument, is a circumstance belonging to the nature of general language. An analogous fact in arithmetic is familiar to every one. Twice ten are equal to twenty, whether the subject of the calculation happens to be shillings

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or pounds, or men or marbles; but it cannot be affirmed, that, on this account, the words twice ten are twenty are destitute of meaning, or that their meaning is left out of consideration.

The whole truth of the matter in question (and this may have been all which the passage under review, so incautiously worded, was intended to express) is, that we may reason with terms, however general may be their signification, under the condition, of course, that they have some signification to reason about.*

It is worth while, in further elucidation of the subject, to quote the following paradox, as Mr. Hallam justly terms it, thrown out by Hobbes in his correspondence with Descartes, for the sake of the reply given by the latter, coinciding so exactly as it does with the views advanced in the present treatise.

* Mr. R. E. Scott, in his able work entitled "Elements of Intellectual Philosophy," gives some acute comments on the passage already referred to in Dugald Stewart's first volume, in which that philosopher asserts that, in order to perceive the justness of the inference (in a syllogism like that quoted above) it is not necessary *to understand its meaning.* "Though I by no means admit," says Mr. Scott, "that it is not necessary to *understand the meaning* of a syllogism in order to perceive the justness of its inference, yet, without doubt, our assent will be given to a syllogism, although its terms be successively varied, according to a certain principle." He afterwards adds that a syllogism "whose minor is *z is an x* will never enforce our assent, unless we settle, by previous definition, that *x* denotes a genus or species of which *z* is an individual." p. 150.

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" Que dirons-nous, maintenant," writes Hobbes, "si peut-être le raisonnement n'est rien autre chose qu'un assemblage et un enchainement de noms par ce mot *est?* D'où il s'ensuivroit que par la raison nous ne concluons rien de tout touchant la nature des choses, mais seulement touchant leurs appellations, c'est-à-dire que par elle nous voyons simplement si nous assemblons bien ou mal les noms des choses, selon les conventions que nous avons faites à notre fantaisie touchant leurs significations."

To this curious passage Descartes very aptly replied:—

" L'assemblage qui se fait dans le raisonnement n'est pas celui des noms, mais bien celui *des choses signifiées par les noms;* et je m'étonne que le contraire puisse venir en l'esprit de personne."*

In reasoning on some subjects, little progress, indeed, could be made without language. It is not always seen, however, that this observation is applicable far more to written than to spoken language, to visible symbols than to articulate sounds. Yet no one would dream of attempting on this account to restrict logic to written language.

The great expedients which have been devised to assist the intellect in the most abstract calculations,

* Quoted from the works of Descartes by Mr. Hallam in his Introduction to the Literature of Europe, vol. iii. p. 248.

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owe their efficiency to their symbols being presentable to the eye at pleasure, and thus constituting visible fixed stations, where the mind can repose, where it can always find what has been already accomplished, and from which it can again start in pursuit of new results. Sounds, it is true, are associated with these visible symbols; but they play a subordinate part in such processes, and would be incapable alone of enabling the mind to proceed beyond a comparatively short distance.

Reasoning, in brief, is one species of thinking; and, like all other thinking, except that of which language is itself the subject, may be carried on independently of words. When language is used, it forms only an instrument of the process; sometimes, indeed, exceedingly useful, and even indispensable, but never constituting the process itself, any more than laughter constitutes mirth, or a frown displeasure; or, to pass over to another class of illustrations, any more than shoes or sandals constitute walking, although they may help the walker; or than lenses constitute seeing, although without them we could not attain the sight of myriads of stars, which, to the unassisted eye, are hid in the depths of space.

The calculus which enabled Adams and Leverier to point out the spot in the heavens where an unknown planet was wheeling through its remote orbit, and the telescope through which Galle dis-

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covered it*, are both alike instruments by whose aid the natural faculties can reach to knowledge otherwise inaccessible, but which confer no new faculty on the intelligent agent who employs them.

* It is generally understood that M. Galle of Berlin discovered the planet Neptune, Sept. 23. 1846, in consequence of a communication from M. Leverier.

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CHAP. X.

THE RELATION OF OBSERVATION, EXPERIMENT, AND INDUCTION, TO REASONING AND TO EACH OTHER.

THE terms at the head of the present chapter denote closely allied and frequently intermingled operations, which it seems desirable to investigate, in order to show in what relation they stand to each other, and more particularly in what relation reasoning stands to the rest.

Experiment is usually placed in antithesis to observation, as if one excluded the other; but surely the intellectual act termed observation is just as much required for experiments as it is for spontaneous events. Unless experiments are observed, they can clearly be of no use. It is equally true, if not equally clear, that the observation of either spontaneous or experimental phenomena can scarcely take place without reasoning, and, if it could, would be of no scientific value.

To illustrate this by an example. We observe a stone fall rapidly to the ground, and a feather, floating in the atmosphere, slowly descend. Meditating on these events, we conjecture, or infer, that the air through which they fall has something to do with the difference in the rates of their descent. We, in consequence, devise the experi-

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ment (in which, also, reasoning is needful) of placing the two substances in a vessel exhausted of air; and we find that, on precipitating them from the same height, they come to the bottom of the vessel at the same moment. We try other substances with a similar result, and finally deduce the general law, that all substances at the surface of the earth descend *in vacuo* from equal heights in equal times.

There is evidently here, in the first place, observation of facts spontaneously occurring; then reasoning or conjecturing something from those facts, viz., what would result from withdrawing the element of air; further reasoning as to the mode of withdrawing it; acting on this reasoning by trying the experiment; subsequently making other experiments; and finally deducing a general conclusion, or law.

But, not only have we here observation of spontaneous and experimental phenomena with an intermixture of reasoning, but we have in those combined operations an example of what is usually termed induction. Induction is not some process superadded to those here described; but it is, in this instance, a combination of the two intellectual operations of observing and inferring, with the mechanical aid of experimental contrivances to enlarge their range, and for the purpose of deducing a general law.

It thus appears, that, instead of contrasting ob-

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servation and experiment, we should contrast spontaneous and experimental phenomena as alike subjects of observation. Facts furnished by artificial contrivances require to be observed just in the same way as those which are presented by nature without our interference; and yet philosophers are nearly unanimous in confining observation to the latter phenomena, and speaking of it as of something which ceases where experiment begins; while, in simple truth, the business of experiment is to extend the sphere of observation, and not to take up a subject where observation lays it down.

In regard to Induction, the view which I have here taken of it coincides, if I mistake not, with that which is to be found in the writings of our most eminent philosophers, from Lord Bacon to Dr. Brown.

By logical writers, it has, indeed, been used in a much more limited sense, viz., that of inferring a general conclusion from either a complete or an imperfect enumeration of particular instances*;

* Thus Le Grand: "Inductio est argumentatio qua ex plurium singularium recensione, aliquid universale concluditur."—*Institutio Philosophiæ*, p. 57, ed. 3. A.D. 1675. And Wallis: "Inductio est argumentationis seu syllogismi forma, qua probatur quid verum esse de generali quopiam, ex eo quod verum sit de particularibus omnibus sub eo generali contentis; saltem de tot horum enumeratis, ut credibile sit de reliquis item esse verum."—*Institutio Logicæ*, ed. 4, p. 198.

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and even some philosophical writers of the school of Bacon have employed it, in an analogous acceptation, to denote merely the process of inferring a conclusion more general than the premises from which it is drawn.

If we turn, however, to the pages of such writers as Reid, Stewart, and the more metaphysical followers of Bacon, we shall find the term there signifying the process of obtaining or preparing the premises, and frequently distinguished from that of inferring the conclusion; in other words, it is used to denote that combination of observation and reasoning which has been already described as preceding the final inference.

Mr. Stewart, for instance, speaks of "those general conclusions concerning the established order of the universe, to which, when legitimately inferred from *an induction sufficiently extensive*, philosophers have metaphorically applied the title of Laws of Nature;"* where the term induction clearly denotes something that precedes the inference, and of course does not include it.

In a similar way Dr. Brown speaks of "a wide induction."

"There is a constant tendency," he says, "in the mind to convert a general law into a universal law, —to suppose, *after a wide induction*, that what is true of many substances that have a very striking

* Elements, vol. ii. p. 224, ed. 2.

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analogy, is as certainly true of all that have this striking analogy."*

Professor Playfair, in giving an account of Bacon's method, teaches that we are to begin by excluding certain things from our collection of facts. "This exclusion," he continues, "is the first part of the process of induction."†

Other writers speak of "a partial" and "an incomplete" induction, phrases manifestly referring to the observation or examination of instances.

In the preceding passages induction is clearly regarded as a process of investigation preparatory to the formation of a general law.

This process may be more or less complicated according to circumstances, and includes or may include, as I have shown, observation of both spontaneous and experimental phenomena, and the intermixture of such inferences as may be necessary to establish what I have before termed the collective fact, from which the general law is to be deduced.

It must be allowed, nevertheless, that there is a good deal of laxity in the employment of the word, even in the writings of our most eminent philosophers. Lord Bacon manifestly uses it to denote a mixed process of observation and reasoning; but he is not altogether exempt from the common want

* Lectures, vol. i. p. 191.

† Preliminary Dissertations. Encyclop. Britannica, p. 460.

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of precision in applying it*, and he sometimes includes, under the term, the formation or deduction of the general law as well as the examination of instances. Newton has, I think, fallen into an ambiguous use of the word in a passage which occurs at the conclusion of his "Optics." While the extract now presented will furnish an instance in point, it will exemplify also the manner in which observation and experiment are commonly, and in my view inaccurately, distinguished.

"Analysis [in natural philosophy] consists in making experiments and observations, and in drawing conclusions from them *by induction*, and admitting of no objections against the conclusions but such as are taken from experiments or other certain truths. For hypotheses are not to be regarded in experimental philosophy. And although the arguing from experiments and observations *by induction* be no demonstration of general conclusions; yet it is the best way of arguing which the nature of things admits of, and may be looked upon as so much the stronger by how much *the*

* "Inductio enim quæ procedit per enumerationem simplicem res puerilis est, et precario concludit, et periculo exponitur ab instantia contradictoria et plerumque secundum pauciora quam par est, at ex his tantummodo quæ præsto sunt pronunciat. At inductio, quæ ad inventionem et demonstrationem scientiarum et artium erit utilis, naturam separare debet per rejectiones et exclusiones debitas, ac deinde, post negativas tot quot sufficiunt, super affirmativas concludere." — *Nov. Org.*, lib. i. aph. cv.

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induction is more general: and if no exception occur from phenomena, the conclusion may be general."*

In the first and second use of the term in this passage, the intention of the writer was manifestly to characterise the drawing of the conclusion, although the meaning is not very happily brought out, since we cannot with propriety speak of drawing conclusions by means of the operation itself, or of any other operation. In the last use of the term, he evidently meant to characterise the comprehensiveness of the preliminary observation.

I have already cited Mr. Stewart as using the term induction, to denote the course of investigation preparatory to the formation of a general law; but in another passage, where he describes the *method* of induction, he includes also the final inference.

"Wherever," he says, "an interesting *change* is preceded by a combination of different circumstances, it is of importance to vary our experiments in such a manner as to distinguish what is essential from what is accessory; and when we have carried the decomposition as far as we can, we are entitled to consider this simplest combination of indispensable conditions as the *physical cause* of the event.

"When by thus comparing a number of cases,

* Dr. Johnson gives the greater part of this passage in his Dictionary, to support his second definition of the term, borrowed from Watts's Logic, viz. "Induction is when from several particular propositions we infer one general."

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agreeing in some circumstances, but differing in others, and all attended with the same result, a philosopher connects, as a general law of nature, the event with its *physical cause*, he is said to proceed according to the method of *induction*. This, at least, appears to me to be the idea which, in general, Bacon himself annexes to the phrase; although I will not venture to affirm that he has always employed it with uniform precision. I acknowledge also that it is often used by very accurate writers, to denote the whole of that system of rules of which the process just mentioned forms the most essential and characteristical part." *

It appears then, from the authorities I have cited, that there are at least three different modes of employing the term; viz. to denote,

1. The investigation of facts, preparatory to the formation of a general law;
2. The mere inferring of the general law from the facts brought together by such investigation;
3. The two preceding processes combined.

The first of these acceptations appears to me to be the most conformable to the general usage of philosophical writers, and for that reason the most convenient to adopt.

If this discussion should appear to turn on a mere question of phraseology, it must still be allowed, that to settle the meaning of so important a word

* Elements, vol. ii. p. 348.

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as Induction is exceedingly desirable and worth some pains. At present it may be doubted whether any two men of science, taken at random and not being technical logicians, would give the same definition of it.

My principal aim, however, in the present chapter has been, in consonance with the subject of my treatise, to point out how far reasoning is concerned in this important combination of intellectual operations. I have accordingly endeavoured to show, that induction cannot be carried on without a continual intermixture of inferences with observation; and that the result to which the whole converges, is the formation of a general law, — itself an act of contingent reasoning.

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CHAP. XI.

RULES FOR GUIDING THE OPERATIONS OF REASONING, AND ESPECIALLY THE RULES OF THE SCHOLASTIC LOGIC.

A TRUE theory of the reasoning processes, or, in other words, a thorough comprehension of their character, although fortunately not essential to the right performance of the acts, may be expected to assist us in some degree to arrive at correct conclusions; but will perhaps be more especially serviceable in preventing that misdirection of our powers, and that waste of attention on wrong objects, which are the usual results of a false theory on an important subject.

It must also tend to inspire us with confidence in our deductions, and with fearlessness in submitting them to the examination of others, in proportion as it enables us to discern the character of every link in the chain of argumentation.

Whether, nevertheless, such an insight into the nature of the processes will afford any formal rules to guide us in the performance of them, and whether any such rules are needed, seem to be points not equally clear.

From the preceding exposition of the subject, it

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will have been seen, that the operations which pass under the name of reasoning are of a simple character; so simple, indeed, that a thorough comprehension of what they are seems all that is requisite to guard us against any irregularity to which they may be liable, if they are liable to any.

But this is a question which will perhaps be best elucidated by a separate examination of it in relation to each species of reasoning.

Section I.

Rules in Contingent Reasoning.

In regard to those acts of contingent reasoning from one individual event to another, which are constantly occurring in the common business of life, rules can scarcely have place, since in them we do nothing but infer that some unknown event will happen, or has happened, in certain circumstances, from our having known a similar event to have taken place in similar circumstances: if any precept is wanted to guard us from mistakes, it is merely an injunction to take care that our premises are correct, *i.e.* that the circumstances *are* similar. We may erroneously regard cases as resembling each other, which really do not; a fault of observation, or a misconception, or a misrecollection, rather than an error of inference.

When, however, we turn to those important acts of contingent reasoning which consist in the in-

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ference of general laws, the case is somewhat altered in its aspect, and the operation seems less simple. Yet still it will be found, if I mistake not, that the greater complexity which then appears is the complexity of the several operations concerned in the preliminary inquiry needful to collect and arrange the facts from which the inference is to be drawn.

Accordingly, if we examine the rules which have been laid down by Lord Bacon and his followers, we shall find that they are precepts for carrying on induction (in the sense annexed to that term in a former chapter); for instituting experiments, altering the combination of circumstances by leaving out some or adding others, and watching the results; which operations are not reasoning, although reasoning, as before explained, must be, or may be, employed in conducting them.

They are to be regarded, in truth, as engaged in establishing the collective fact, or the premises from which inferences to new cases are to be drawn, or a general law is to be inferred.

When it is stated, for example, from an ample survey of the subject, that a certain cause has always, as far as observation has extended, produced a certain effect, this is not an inference or conclusion, but simply giving the summary result of inductive investigation.

When, however, we expect or predict, on a new occurrence of the cause, that the effect will follow,

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or lay down the general law that the cause always produces the effect, we do not state a mere matter of fact, but we draw an inference; it is, in either case, an act of direct contingent reasoning.

Thus, in the formation of a general law, as in the inference of one particular event from another, the operation which is solely entitled to the appellation of reasoning is equally simple; and the question is, can so simple a process go wrong, and the correct performance of it be assisted by rules?

It is undoubted that we constantly witness instances of hasty and undue generalisation, or, in other words, of drawing general inferences not warranted by the facts from which they are drawn; and these seem, after the strictest analysis, to be, on many occasions at least, really errors of reasoning.

When a person, smarting under the dishonesty of some pretended friend, who has betrayed him for a bribe, exclaims, "Every man has his price," he draws his universal inference from a single case, and it is immediately seen by others to be a hasty and undue generalisation. This example, indeed, we may consider in two lights. If we regard the conclusion, it is obviously too wide for the premise; if we regard the premise, it is obviously too scanty for the conclusion; but in whatever light we regard the argument, the mistake is in drawing the inference, not in laying down the premise. The fact forming the premise, viz., that a friend

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has been seduced from his duty by a bribe, is the only fact (by hypothesis) before the reasoner; and if he draw an inference from it at all, it should be one of something like corresponding extent, as, "therefore, other men in similar circumstances may be occasionally expected to act in the same way." To deduce a universal conclusion in such a case from a single fact is manifestly an error of deduction.

The error, however, of many of these instances of unwarranted generalisation lies in the premises. A part only of the facts have been properly examined, and yet the whole are assumed to have been so. The premises in these cases, as expressed or asserted, warrant the inference, and the erroneous conclusion is, therefore, due to the manner in which they are assumed. Undue generalisation results probably oftener from this cause than the other, and is to be corrected by nothing but stricter attention to facts.

Even in cases where, as in the example above cited, the fallacy is evidently in the reasoning, an instructive method of attempting to correct it would be trying how far other facts would bear out the conclusion; endeavouring, in a word, to enlarge the premises, rather than to shape the conclusion to the dimensions of the single fact, although the last method of proceeding has also its value.

These considerations show that rules for avoiding

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erroneous conclusions in contingent reasoning are in the main rules for the investigation of facts, or for laying down premises, and belong to the general art of inductive inquiry.

Perhaps the only rule of practical importance to guard us against pure errors of inference in these cases (expressed in general terms), is the injunction to proportion the extent or generality of the conclusion to the facts from which we draw it. When these facts are susceptible of numerical expression, the law which we can deduce from them becomes susceptible of the same. The methods of calculation, in such cases, come under a separate science, usually termed the Theory of Probabilities, which is itself an auxiliary of induction, and may be regarded as an offset or branch of contingent reasoning. The result of it, when its methods are well applied, is to proportion, with all possible exactness, the law deduced to the facts from which it is inferred.

Section II.

Rules in demonstrative Reasoning, and especially in Class-Reasoning.

We have next to inquire how far demonstrative reasoning may be assisted by rules.

In that branch of it which is not class-reasoning, and of which the mathematical enthymeme may be regarded as the type, there seems to be no place

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for rules to guide the process or guard it from error. That one thing is implied by another is discerned at once; or, if not, it can be discerned only by acquiring the necessary knowledge to discern it.

We cannot, however, so easily dismiss that variety of demonstrative reasoning which is usually termed syllogistic, but which, for reasons before assigned, I have denominated class-reasoning, although it is really as simple as the rest, and requires, like them, little or no assistance from rules. But learned men long thought, and many of them still continue to think, otherwise. It is one of the remarkable circumstances in the intellectual history of the world, that between two and three thousand years ago, this simple process of class-reasoning was regarded as a matter of such great nicety and difficulty, that a complicated system of rules was expressly devised to prevent mistakes in performing it. In subsequent ages of unsound philosophy, the scholastic logic became still further exalted and magnified to an undue and even preposterous importance. The very narrowness of its range appears to have concentrated the skill and ingenuity of the human mind on the contrivance of an intricate machinery to accomplish the little there was to do in this limited sphere, under the impression that it was much, and that it was absolutely all.

That species, or rather that variety of reasoning,

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which consists in predicating an attribute of some individual or individuals of a class, because it is predicable of all the class, or in other allied operations, seems on a first view to be a very simple affair, in which it would be difficult to go wrong, and in which rules would be needless; and yet we find a most ingenious and elaborate system of distinctions, maxims, and canons, constructed with no other purpose than to ensure its being correctly performed. It seems scarcely credible, when stated in plain terms, that the scholastic logic, with all its formidable apparatus, proposes to itself, as its sole ultimate object, to secure the correctness and try the validity of the simple processes of class-reasoning. Hence this singular monument of human ingenuity, dedicated to so small an object, would be almost worth a particular examination, even if its real character had been universally appreciated, and it had been suffered to take its place amongst the obsolete systems of past ages. But since its claims to practical importance have been recently revived and re-asserted by writers distinguished for their talents and learning, an attempt to estimate the value of its rules seems an indispensable step in the treatment of my subject, although it will be giving to the question a larger space than in such a treatise it ought naturally to occupy.

I purpose, accordingly, to examine the assistance which the scholastic logic affords in the depart-

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ment to which its own theory has confined it; to inquire how efficiently it performs its part in the limited province which logicians so long mistook for the whole domain of reasoning. And when (as I further purpose to do) I have followed up this examination, and my previous exposition of the principles and forms of reasoning, by some remarks on the value of the system as externally manifested by its effects in action and in science, and on its influence as an intellectual discipline, I shall have taken a survey of its most important features.

Section III.

Subject continued: Mode of using the Syllogistic Form.

In order to clear the way for the inquiry proposed in the last section, it is necessary to premise that there are two different views entertained or entertainable of the way in which the syllogistic form ought to be employed.

One of these views regards the regular syllogism as a method of arguing which is to be commonly adopted.

The other regards it simply as a form into which any arguments may be thrown for the purpose of testing their validity, and disclaims it as the ordinary instrument of reasoning or controversy.

With regard to the first, which was the view

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that long prevailed in the schools, it is obvious, to modern eyes, that to adopt the syllogism as the ordinary method of conducting argumentation, even on the supposition of its being the universal type of reasoning, would be excessively tedious and embarrassing; and, indeed, at the present stage of intellectual advancement, impracticable.

This view, accordingly, of the proper method of applying the syllogistic art is now not only abandoned, but we are told that "it is a mistake to suppose that Aristotle and other logicians meant to propose that this prolix form of unfolding arguments should universally supersede, in argumentative discourses, the common forms of expression."

Whatever may be the light in which modern writers may regard the subject, this prolix form, nevertheless, was not only for a long period used in the schools, as the most efficient instrument of controversy, and the best method of pursuing truth, but even so late as the early part of the eighteenth century, the utility of carrying on a controversy in writing by a mutual exchange of syllogisms, and with a strict observance of the legitimate forms, was maintained by no less a philosopher than Leibnitz.

Since, however, the common employment of the syllogistic form in argumentative discourse or controversy is no longer advocated, it must be examined in the character in which it presents itself

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to us in the writings of its modern expositors; namely, as a form into which reasoning may be reduced in order that the rules of logic may be applied as tests for trying the validity of arguments. Its claims are thus stated by one of the most eminent amongst the logical writers of the day. "Logic," says Dr. Whately, "which is, as it were, the grammar of reasoning, does not bring forward the regular syllogism as a distinct mode of argumentation, designed to be substituted for any other mode, but as the form to which all correct reasoning may be ultimately reduced; and which, consequently, serves the purpose (when we are employing logic as an *art*) of a test to try the validity of any argument; in the same manner as by chemical analysis we develope and submit to a distinct examination the elements of which any compound body is composed, and are thus enabled to detect any latent sophistication and impurity." *

In this statement, however, of the mode in which the form is to be used, the syllogism itself is represented as a test, while it manifestly can be considered only as the shape into which class-reasoning may be put, in order to apply the several tests furnished by the rules of the art. It is not the bed on which the logical Procrustes is to lay his victims, but only the outstretched posture in which he is to place them upon it.

* Elements of Logic, p. 11

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Section IV.

The Subject of Rules continued: Rules of the Scholastic Logic.

Agreeably to what has been stated in the preceding section, we are now to consider the scholastic logic, as a guide to correct conclusions, by furnishing tests for the detection of fallacies in that variety of reasoning which comes under the designation of class-reasoning.

In this character the system might, perhaps, be reasonably expected to do two things; first, to give us directions for reducing, with all practicable readiness and precision, the arguments which we meet with, or which occur to us, into the syllogistic form; secondly, to furnish us with the best rules for testing the validity of the syllogisms when they are before us. In the first respect here mentioned, the common treatises on logic, as far as I am acquainted with them, afford us little help. Logicians may, perhaps, consider it as being, like the laying down of premises, out of their province; yet this, after all, is the great difficulty which the anxious searcher after right conclusions has to cope with. Generally speaking, the validity or invalidity of an argument is easy to be discerned when it has been stripped of un-

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necessary incumbrances, and reduced to the form of two or three definite propositions.*

In reference to the second and easier assistance which the system ought to furnish, there is no similar deficiency. Logical treatises abound with rules for insuring the correctness of the syllogistic process, and the detection of errors in it. They give us copious directions how to deal with any syllogisms which may present themselves to our notice; they, in truth, encumber us with help, but with help of a peculiarly artificial character. The general scope, indeed, of the scholastic system may be described to be to enable us, by the adoption of technical language and distinctions, to apply mechanical rules to reasoning when it has been brought into the syllogistic form. The question we have now to try is not between rules and no rules, but between natural and artificial rules.

A recourse to mechanical rules in the way described, which is essentially an artificial method, in order to supersede the direct application of the mind to the subject in hand, which may be called the natural method, is in truth substituting processes requiring little or no thought when once learned, for such as demand conscious intelligence

* Perhaps the student might derive some useful hints towards this species of reduction from the Abbé Gaultier's ingenious work entitled "A Method of making Abridgments, or easy and certain Rules for analysing Authors." London, 1800.

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at every step, and seems eligible only under certain conditions.

If the natural method is sufficiently simple and easy, and fully adequate to its purpose, the introduction of an artificial one is a sheer impertinence, entailing waste of time and labour. If, on the other hand, such mechanical rules replace a long by a compendious process, or a difficult by an easy one, or lead us to the desired result with more certain accuracy than precepts or principles which keep the matter throughout present to our consciousness, there is a presumptive advantage in resorting to their assistance. In these cases, they can be wisely rejected only on the ground that they are attended with preponderant evils in other directions; and when they enable us to accomplish valuable ends, which could not be effected at all without them, there can be no question as to the wisdom of calling them to our aid.

Some of the systems of artificial memory, for instance, appear to have the merit of enabling those persons who use them to remember things which they could not otherwise so firmly retain, or recollect with equal promptitude and accuracy; but it may be justly objected that this advantage, which is at best only one of degree, is dearly purchased at the expense of connecting our knowledge with images and sounds, and other associations, to which it has no natural affinity, and thus filling the mind with incongruous and fantastic trains of

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thought. Accordingly, such expedients, except a few of the simplest kind, in which the alleged evil is not prominent, have fallen into general neglect.

On the other hand, those technical terms and mechanical rules and formulas, which are employed in the various departments of calculation, although they may not be improving to our principal mental faculties, do not, at all events, fill the mind with incongruities, while they in some cases substitute short and easy processes for longer and more difficult ones, and in others enable us to arrive at results which we should vainly attempt without them.

That the peculiar assistance which the scholastic logic holds out is of this technical and mechanical character, no one will probably dispute. Its professed business is to leave out of consideration facts and things, and deal with terms and propositions; and these it denudes, as much as possible, of meaning, that their most general relations may be alone regarded.

Moreover, after affixing technical acceptations to certain words, it constructs rules and symbols, by the observance and employment of which we may draw our conclusions correctly, without taking into view the particular signification of what we are reasoning about—without, in truth, any expenditure of thought; and, of course, by the mechanical application of these rules to the arguments of others, we may test their soundness, with a

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similar disregard of their special import. The questions, then, which we have to consider, are whether these mechanical tests are needed, and are superior in efficiency to such as we may derive, when requisite, from the matter and meaning of the reasoning; and whether they are not attended with intellectual disadvantages, which must, in any case, render their adoption inexpedient.

The principal constituent parts of this mechanical ordeal (and it will not probably be deemed requisite to examine any other than these) are the rules relating to the distribution of terms, the devices and directions for reducing what are called imperfect syllogisms to the first figure, and the canons or maxims which have been introduced to supersede the necessity of such a reduction.

Our first business, then, will be to examine whether the rules relating to the distribution of terms furnish any valuable assistance.

Let us take one of the rules laid down on this point, "No term must be distributed in the conclusion, which was not distributed in one of the premises;" and let us apply it to the following reasoning:

All men are mortal;
Angels are not men;
Therefore angels are not mortal.

Now, in order to determine whether this syllogism is valid by the above rule, you must examine the two terms in the conclusion, when you will

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find that both of them are there distributed. You find, further, that the minor term "angels" is distributed in the premises, but that the major term "mortal" is not distributed in the premises. The rule consequently is violated; there is what is called an illicit process of the major, and the syllogism is not valid.

No doubt that in this way we detect the fallacy; but surely we detect it at once, without passing through this examination of the technical conformity of the terms to the logical canon. We see from the meaning of the propositions, that the argument is unsound, as readily as we discern that a term is distributed in the conclusion which is not distributed in the premises. A person who was unacquainted with the distribution of terms, on hearing such an argument, would probably exclaim, "Angels are *not* mortal, because they are not men, who *are* mortal! Why, the same reason would prove that pigs are immortal! If men were the only mortal beings in the universe, the reasoning would be good."

It is obvious that the circumstance of your not belonging to a given class is no proof that you do not possess any quality in common with the class. You are not a cow, but this is no proof that you do not breathe.

The same result will attend an examination of the rule which requires the distribution of the middle term. I have seen it somewhere argued

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that the very viciousness of Negroes proves them to be men. Putting this argument syllogistically, and supplying, for the sake of illustration, a major premise to suit our purpose, we have,

All men are vicious ;
Negroes are vicious ;
Therefore they are men.

Here a logician would at once see that the middle term "vicious" is not distributed, and would pronounce the argument unsound. But it is just as easy to see that the fact of Negroes being vicious would not prove them to be men unless that quality were the exclusive attribute of men.

The logical rule is, that the middle term must be distributed, otherwise the syllogism is false.

The real or material rule is, that the possession of one quality, or one set of qualities, in common with a given class, does not of itself prove the possessors to belong to the class. A cow breathes in common with human beings, but this is no proof that she belongs to the genus *homo*.

The technical rule is not only without any pretension to be easier of application than the material one, but it tends to keep out of sight the substance of the fallacy committed. In fact, the system puts us in such cases to twofold or threefold trouble. We have first to learn the rule and to discern its validity, and we have then to apply it mechanically to the syllogism before us; but neither of these steps is easier than the immediate

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discernment of the substantial error in the reasoning by an equal application of the mind to the matter of the argument.

The rules, nevertheless, regarding the distribution of terms, and the rules generally regarding syllogisms, although such as are merely technical might be replaced with advantage by what I have called material rules, are, at all events, easy of acquisition, as well as capable of being readily turned to some account, and hence are by no means the most exceptionable features of the scholastic logic.

The second class of rules before mentioned, viz., those relating to the reduction of syllogisms, and to what are denominated the moods and figures, which make a great show in logical treatises, constitute a much more objectionable part of the system, demanding wearisome study before any one can attain such a familiarity with them as is requisite for use, and yielding no fruit but what (if I may hazard the metaphor on such a subject) is full of the ashes of time thus laboriously consumed.

The acknowledged fact to which I have before adverted, that every syllogism is not an exemplification of the dictum, or, in the language of logicians, that the dictum is not directly applicable to every syllogism, led to two different modes of proceeding, in order to prove (still to use their

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own language) the validity of the reasoning in such cases. The first (and this was the method of Aristotle himself) was to have recourse to the conversion of propositions and the transposition of premises, for the purpose of bringing every syllogism that did not exemplify the maxim into a shape in which it would, *i. e.*, under what is technically called the first figure.

Thus the scheme of moods and figures, the barbarous phraseology by which the former are designated, and the reduction of syllogisms according to certain literal indications from one mood and figure to another, may be regarded as the progeny of the unsound doctrine that all reasoning proceeds on one principle, and of the supposed necessity of bringing all arguments under it.

In the chapter on the general principles of reasoning, I have shown that each figure or variety of syllogism proceeds on, or exemplifies, its own principle; and such being the case, if it is necessary, on any occasion, to appeal, after the manner of mathematicians, to any axiom, the particular maxims belonging to the figure may be cited, without resorting to the intricate machinery for transmuting one form of argument into another.

Let us examine, nevertheless, what this process of reduction effects. Take an example from Dr. Whately. He gives us the following syllogism in the mood Camestres, as one to be reduced:

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All true philosophers account virtue a good in itself;

The advocates of pleasure do not account virtue a good in itself;

Therefore they are not true philosophers.

One would think this sufficiently plain; but it does not come within the first figure. It must, therefore, be brought into a mood which does. Reduced to the mood Celarent by conversion and transposition, the syllogism assumes the following appearance:

Those who account virtue a good in itself are not advocates of pleasure;

All true philosophers account virtue a good in itself;

Therefore no true philosophers are advocates of pleasure.

But still the conclusion we have got is not the original conclusion; and, in order to show that we have obtained an equivalent one, we must force it to undergo *illative conversion*, when it will emerge in the form of, *No advocates of pleasure are true philosophers;* which must, in its turn, be transmuted by a slight alteration into the equipollent and pristine proposition, *The advocates of pleasure are not true philosophers;* and, at length, our work is done.

It is manifest that here, after all this logical labour and circuitous ingenuity, we gain nothing. The syllogism, which issues out of the operation, is not in the slightest degree clearer than the original one.

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So much for the first method of getting over the inapplicability of the dictum to the second, third, and fourth figures. The second method was to allow the refractory syllogisms in these figures to retain their forms, and to call in the aid of other principles or maxims which might be directly applied to them. Discarding altogether the process of reduction, it borrowed two mathematical axioms, changing the term equality to that of agreement. They are, "if two things [or terms] agree with one and the same third, they agree with each other;" and "if one thing [or term] agrees, and another disagrees, with one and the same third, they disagree with each other."

If these maxims are taken in their obvious acceptation, they are such as many of our common reasonings exemplify. Thus we sometimes argue that two objects agree in form, colour, smoothness, temperature, resplendence, and other qualities, because they have been severally compared with a third object, and found to resemble it in these respects. In this acceptation they further elucidate the truth, that demonstration proceeds on a variety of principles besides the dictum.

But this is not the sense in which the logical canons are to be understood. The phrase, "*Agreeing with a term*," is to be taken in a peculiar technical acceptation; and unless certain rules respecting the comparison and agreement of wholes and parts of terms are understood and observed, the

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maxims, as they are called, are neither evident nor applicable.

It is obvious that these maxims, so interpreted, are not analogous to such as were considered in the chapter on that subject. They are not educible from the syllogisms in any of the figures; nor are they to be classed with the mathematical axioms from which they have been transformed. Bearing the semblance of self-evident maxims, they are, in truth, very artificial rules by which, with the help of other rules, and technical distinctions, the validity of syllogisms may be tested.*

* Logicians are far from being agreed as to the merits of the method here described. Wallis speaks of it in the following terms: "Nonnulli autem Logici (nostri seculi aut superioris) posthabitâ veterum probatione per *Dictum de Omni et de Nullo;* aliud substituunt illius loco postulatum; nimirum, *Quæ conveniunt in eodem tertio conveniunt inter se.* Atque ad hanc regulam exigentes singulos syllogismorum modos, inde conclusum eunt justam eorum consecutionem. Quique sic procedunt, negligere possunt eam distinctionem modorum *perfectorum et imperfectorum*; ut quæ ortum ducit ab ea methodo qua usi sunt veteres, in probatione sua ab illo Dicto. Ego veterum probationem ut potiorem amplector, Aristotelis methodo conformem."—*Institutio Logicæ*, lib. iii. cap. 5.

It may be well to subjoin Mr. Walker's commentary on this method. "But clear as these principles are in mathematics, when transferred by analogy to the agreement or disagreement of terms or ideas, in affirmative or negative propositions, they by no means have that definite and certain meaning which is necessary in principles that are taken for the basis of such a superstructure as the doctrine of syllogisms. Aristotle had too much penetration to rest the doctrine on this foundation."—*Commentary on the Dublin Compendium of Logic*, by John Walker, 4th ed., p. 93.

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It is needless, perhaps, to task the reader's patience by any detail in reference to this second method. In order, however, to complete the survey of these mechanical aids, I will adduce a single example of the way in which it is carried into effect.

Let the syllogism to be put on its trial be the following:

Some logical writers are tedious;
Wallis is a logical writer;
Therefore Wallis is tedious.

Here the major term, *tedious*, has been compared to only a part of the middle term, *logical writers;* and the minor term, *Wallis*, also to only a part of it. And since these two parts, for aught that appears, may be different portions of the same whole, it cannot be affirmed that the major and minor terms have been compared with one and the same third, nor, consequently, that they agree with each other. The canon has not been complied with, and the conclusion does not follow from the premises. Wallis is not proved to be a tedious writer.

This is all very true; but it is a very roundabout method of detecting a fallacy which is obvious on a bare inspection, or which may be made apparent, if any aid be wanted in so plain a case, by a simple material rule; or which may be made readily proved even by resorting to the rule which requires the distribution of the middle term.

As a method of testing syllogisms, it is scarcely

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less intricate, and not more satisfactory, than the other methods already examined.

From the whole of this, I fear, wearisome investigation, it results that the logical system will not bear the criteria applied to it.

Such an artificial system is needless, because the natural method is ready of application, and sufficient of itself. It does not substitute compendious processes for long ones, nor such as are easy for such as are difficult, nor those which are more certain for those which are less to be relied upon; and it has not the slightest pretensions to the power of conducting us to results which we could not reach without its assistance; while, on the other hand, the study of it requires a great expenditure of time and labour, and, as I shall endeavour to show hereafter, is attended, from its very nature, with intellectual evils of no inconsiderable moment.

Section V.

The Subject of Rules continued: Rules of the Scholastic Logic.

From the preceding examination it appears that there are only two or three errors worth notice which all these distinctions and canons have been devised to guard us against*; and, in the course

* I have not taken cognizance of the rules about negative premises and the infraction of them, because they seem to be

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of it, the obvious truth has been pointed out, that, if rules are at all necessary or useful, a few easy material rules would serve the purpose.

But I have very strong doubts whether the errors in question are ever committed except from confusion or ambiguity of language, or possibly from such a separation of the premises from the conclusion as may occasion a misrecollection of what they are; in each of which cases no assistance could be derived from logical rules.

A valid syllogism, when clearly expressed, is discerned at once to *be* valid. The conclusion is seen to be demonstrated by the premises, and a denial of it to involve a contradiction. The validity of the syllogism itself is a thing beyond proof.

But if a valid syllogism is, in this way, discerned to be conclusive, a fallacious syllogism would, in the same way, be at once discerned to be fallacious or inconclusive, under the same condition, viz. when clearly expressed.

It follows that, when faults are committed in syllogistic reasoning, they must be owing to want of clearness and preciseness of expression; and the

passed over by logical writers with the barest mention. Indeed, the purely logical fallacies, to guard against which the artificial system just examined is solely applicable, are allowed to occupy very little space in most treatises on the subject—and deservedly: but the reader is constantly wondering why so complicated an apparatus is introduced for an end apparently so small in itself and so little thought of by its expositors.

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infallible way to test the soundness and unsoundness of such reasoning is to supply what it wants—to throw it into precise and perspicuous language. This must be sufficient, in the nature of the case, to bring all errors to light.

It may be presumed, therefore, that the fallacies which we have already passed in review under the names of non-distribution of the middle term and illicit processes, when they do occur in regular syllogisms, are owing to ambiguity or confusion of language: in other words, they are never committed when the premises are fully and clearly stated in proper juxtaposition with the conclusion. Let us take an example of the non-distribution of the middle term.

Some animals are cold-blooded;
The sheep is an animal;
Therefore the sheep is cold-blooded.

In a syllogism expressed in this clear unambiguous manner, such a conclusion may be safely pronounced to be impossible.

It may be instructive to remark, that the only discernible or assignable difference between such a logical fallacy, and drawing an unwarranted inference from an insufficient induction of facts, is, that in the latter case, the "*some animals*" adduced are avowedly, although erroneously, taken as sufficient specimens of the rest, and contradictory instances are assumed not to exist; whereas, in the logical error, this is not professedly assumed: the fact of some animals being cold-blooded is alleged

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as a sufficient reason (although it is not pretended that there are not also some animals which are warm-blooded) for concluding any other animal to be so. But a logical error of this kind is so very absurd, that it is doubtful whether any human mind ever really committed it, the actual mistake being either an insufficient induction, or a fault in expression.*

There is the case, indeed, of disparted premises and conclusion already named, in which we may conceive that the logical error might possibly occur, or seem to occur. It sometimes happens that the premises and the conclusion of an argument are widely separated from each other by irrelevant matter, superfluous verbiage, or prolix dissertation, so that, when the conclusion is arrived at, the premises are but indistinctly recalled: and thus the reasoner himself may be betrayed into an inference which they will not support, and into which the reader will in all likelihood supinely follow him. This, however, is misrecollection or misconception of what the premises really are, and

* Mr. Hallam is the only logician, as far as I know, who has remarked in such instances the close similarity of the inductive to the logical error, and the circumstance of one being sometimes confounded with the other. He observes that "the assertion of a general premise upon an insufficient examination of particulars" "is the error into which men really fall, not that of omitting *to distribute the middle term, though it comes in effect, and often in appearance, to the same thing.*"—*Introduction to the Literature of Europe,* vol. iii. p. 220.

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not a wrong inference from them; nor could the error be prevented or detected by any logical rule; but if the argument were freed from its encumbrances, and premises and conclusion, clearly expressed, were brought into juxtaposition, the bad reasoning would be too manifest to impose upon a child.

Let us next take an example of the illicit process of the major term.

All vegetables grow;
Animals are not vegetables;
Therefore animals do not grow.

Is it conceivable that any one could commit a fallacy of this nature? — that a naturalist, for example, after collecting instances to show that a class possess a certain quality, should adduce this collective fact in proof that a totally different class do not possess it? Surely, absurdities of this kind, of which no one is likely even to approach the brink, are beneath the attention of the logical legislator. Rules devised as a safeguard against mistakes which there is no danger of a sane mind falling into may be multiplied without end, but they can form only a dead weight on the system into which they are introduced.

If logical errors are thus owing, in all cases (except in the peculiar case of separated premises and conclusion), to faults of expression, what assistance does the scholastic system afford for guarding against this source of fallacy? None, I am

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persuaded, worth regarding. It is not even pretended that it affords much.

It has, indeed, been urged by some writers that the canons of the scholastic logic assist us to discover them by directing our attention to the middle term, in which any ambiguity is most likely to lurk, as may be seen, they say, in such syllogisms as the following:—

Light is contrary to darkness;
Feathers are light;
Therefore feathers are contrary to darkness.

Here, doubtless, the ambiguity is in the middle term; but the middle term has not, unfortunately, a monopoly of equivocation. It is just as easy, by an ambiguous major term, to prove another extraordinary quality in feathers:—

All bodies are heavy;
A feather is a body;
Therefore a feather is heavy.

The truth is, that in reasoning we are never safe without a constant scrutiny of all the words we employ, *i. e.* without a perpetual recurrence to the things signified; and if our attention is directed to the middle term more especially than to the other terms, we may be led to overlook ambiguities in the latter which might not otherwise escape us.

All this once more forces upon our minds the immense contrast between the elaborate apparatus of the scholastic logic and the inconsiderable end achieved by it; guarding us, at the utmost, from a

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few mistakes in which there is scarcely the slightest risk of our being involved except from causes of error which it is powerless to obviate or to remedy.

These views coincide with those which appear to have been entertained by the authors of the "Port Royal Logic," though not perhaps with uniform consistency.

"If we ever sin," they remark, "against the rules of syllogism, it is by deceiving ourselves with the equivocation of some term. . . . . Not but that there are still other vices of reasoning besides that which springs from the equivocal meaning of terms, *but these it is almost impossible for a man of average mind, and possessed of some knowledge, ever to fall into*, especially in speculative matters, and thus it would be useless to give rules against these vices and urge their observance; and it would, indeed, be frivolous, since the application which would be given to these superfluous rules might divert the attention which we ought to pay to things more necessary."*

Although I have thus been led to an unfavourable appreciation of the system, particularly of the technical and mechanical apparatus peculiar to it, I will readily admit that there are some points about it which deserve preservation.

Few will question that the logic of Aristotle and his followers furnishes a number of useful as well

* Port Royal Art of Thinking, part iv. chap. 8. In this extract I have availed myself of Mr. Baynes's translation.

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as useless distinctions relative to words and propositions; and many convenient terms for designating the parts and incidents of argumentation, including the different kinds of fallacies into which a reasoner is apt to fall. Many, however, of these, indeed most of them that can be considered of importance, are independent of any peculiar theory of reasoning, and may be regarded as of common use.

It must be also admitted, that the syllogistic form may be usefully employed on some occasions, without the reasoner troubling himself with any of the technicalities of the system. We have already seen that much reasoning does exemplify or proceed upon the *dictum de omni et nullo* or other allied *dicta*, and that many arguments which are usually expressed in the form of enthymemes may be rightly expanded into syllogisms. To draw out such arguments, when it is needful to examine their accuracy, into three separate propositions enables us to see distinctly, and to point out to others, the facts which must be true, or proved, or admitted, in order to render the conclusion valid. It is a method of spreading out the premises before us, which may be occasionally resorted to with advantage, even by those who would discard the syllogism as the shape into which every argument might be legitimately thrown, and who would reject all mechanical contrivances for securing a correct conclusion.

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Here, however, we are supposing an enthymeme ready to our hands, while in ordinary cases the chief difficulty, as I have before remarked, would lie in reducing the argument into two or three distinct propositions, not in perceiving the force or the fallacy of the reasoning, when brought into such a regular and definite shape.

We have been hitherto engaged with what may be termed the internal merits and demerits of the system; but it may be instructive to cast a glance on its external effects, or, in other words, its practical value in action and science.

Amongst the most plausible attempts to vindicate the practical value of the syllogistic art, is one to be found in the commentary of Mr. Walker on the "Dublin Compendium of Logic," in which he has contrasted the position of an adept in the art when engaged in controversy, and that of an antagonist wholly ignorant of it.

"A real acquaintance," he says, "with the art of logic will abundantly compensate the labour of acquiring it. Nor have I ever met a person unacquainted with it, who could state and maintain his arguments with facility, clearness, and precision. To instance only in one of the occasions to which it may be applied:—I have commonly seen a man of the acutest mind puzzled by the argument of his antagonist; sensible, perhaps, that it was inconclusive, but wholly unable to expose the fallacy which rendered it so; while a

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logician, of perhaps very inferior talents, would be able at once to discern and to mark it. It was happily remarked by a late lawyer of eminence, in a letter to his son, that nothing is superior to logic for *setting a fine edge* on the understanding."*

Although the correctness of this contrast were to be admitted, the most important point would still be left untouched.

The logician described might, doubtless, possess a superiority over an antagonist who had never attended to the nature of reasoning at all, or who was not familiar with its different phases; but, let us ask, how would he compare with one who had studied the subject in the pages of Locke and Stewart, or in the light in which it has been the aim of this treatise to place it; whose mind had been familiarised with what we are told the scholastic logic disowns—the scrutiny of premises, and with the processes of direct contingent reasoning, and especially the formation of general laws from collected facts; who was capable of discerning the exact range of the scholastic system; who could discriminate a major premise arrived at by

* Familiar Commentary, p. 4. It may amuse the reader to compare Mr. Walker's testimony with that of Locke. "I have known," the latter says, "a man unskilful in syllogism, who at first hearing could perceive the weakness and inconclusiveness of a long, artificial, and plausible discourse, wherewith others better skilled in syllogism have been misled. And I believe there are few of my readers who do not know such."—*Essay on Human Understanding*, book iv. chap. xvii.

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a process of induction, from a useless maxim forced into the same position upon an already effective enthymeme, like a crutch thrust into the hands of a perfectly sound man; and who, through the mere forms of reasoning, could see whether an inference was to be regarded as contingently or conclusively demonstrated; who, in a word, had within him a distinct consciousness of what he was about, of the nature of the processes in his own mind, and a clear view of the bearing of the implicated facts, independently of the forms and phraseology in which they might be expressed?

Although one who had studied an erroneous theory, and an art founded upon it, in which there would probably be a mixture of truth and error, might carry off the palm in a contest with an adversary who had paid no attention to the nature of reasoning at all, it is allowable to suppose that he would, in his turn, find himself inferior to another antagonist who was master of a more correct theory than his own.

But a still more important question remains: which of the two would be likely to have greater success, not in mere personal controversy, but in the pursuit of truth, in the prosecution of science, in the estimation of evidence, and in drawing with accuracy those numberless conclusions which are required from every one by the daily exigencies of life?

It may be considered as a remarkable circum-

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stance, in confirmation of these views of the small practical value of the scholastic logic, that in the rapid progress of science which has marked the last two hundred years, it appears to have had no share and to have yielded no assistance; nor have we any evidence that the greatest philosophers and the most effective reasoners either in practical or speculative matters (Leibnitz perhaps excepted) had so much as a tolerable acquaintance with it. Some of them have even been accused of evincing by occasional errors in their casual references, or their depreciating comments, how little they understood what they referred to or assailed.

Even those writers who have recently attempted to revive the attention of the world to its merits seem to have contented themselves with a theoretical advocacy of its claims; for their writings furnish few proofs that its technical distinctions and mechanical rules have been pressed into actual service. A casual notice here and there that some syllogism which they are employing or commenting upon, ranks under Barbara or Baroko, is all that we meet with.

Should it be replied to this allegation, that these logicians may nevertheless have been tacitly guided by its rules, although they have not allowed the fact to appear; the reply may be admitted as possibly true, although not very probably so, while we have the opposing testimony of no less an authority than Dr. Whately, who, in a remarkable passage,

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has told us that "the generality of logical writers, whenever they have to treat of any thing that is beyond the mere elements of Logic, totally lay aside all reference to the principles they have been occupied in establishing and explaining, and have recourse to a loose, vague, and popular kind of language." * Can there be a more complete surrender of the practical value of all that is peculiar in the art? †

The case of the mathematicians, however, is on the whole, perhaps, the most striking.

Although many of the steps in geometrical reasoning (all of them according to the logicians themselves) may be brought under the *dictum de omni et nullo*, and thus fall within the domain of formal logic, it is notorious that no use of the scholastic rules and distinctions is ever made in this great department of demonstrative science, in which we never hear of undistributed middles, illicit processes, moods and figures, and reduction of syllogisms.‡ Nothing surely can be a stronger external proof of the limited utility, not to say the utter

* Elements of Logic, p. 133., 1st ed. 8vo.

† The following testimony to the want of adaptation in the art to the requirements of intellectual beings is curious. "Experience shows," say the authors of the Port Royal Art of Thinking, "that of a thousand young men who learn logic, there are not ten who remember anything of it six months after having finished their course."—Discourse ii.

‡ It is a remark of D'Alembert's, "que les géometrès, ceux de tous les philosophes qui se sont toujours le moins trompés,

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inefficiency, of the technicalities and mechanism of the logical system. It is plain that the highest, the most accurate, the most recondite, as well as the most popular reasoning in the world goes on without their assistance.

Section VI.

Subject of Rules continued: Effects of the Scholastic System as a Discipline of the Mind.

From the preceding survey of the subject, it is apparent not only that technical rules, by which operations of a mechanical character may be employed to test the validity of arguments, are exceedingly limited in their application, and, when they can be applied, are useless or less useful than rules founded on the matter or signification of the reasoning; but that in argumentative discourse and the prosecution of science they are found to be practically of little or no value.

But this negative condemnation is not all. They are positively evil, not only by all the trouble and perplexity which they needlessly occasion, but in a still higher degree by withdrawing attention from

ont toujours été ceux qui ont fait le moins de syllogismes."—*Elemens de Philosophie*, v. Logique.

"It does not appear," says Dr. Reid, "that Euclid, or Apollonius, or Archimedes, or Huygens, or Newton, ever made the least use of this art; and I am even of opinion that no use can be made of it in mathematics."—*Analysis of Aristotle's Logic*, chap. iv. section 5.

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the substantial nature of all ratiocination, and fixing it exclusively or mainly on the adjustment of terms and propositions. This may, perhaps, be characterised as the grand evil of the Aristotelian Logic, by which it has stunted the minds and fettered the progress of the most intelligent nations.

It is an important truth too generally overlooked, that the habitual application of such mechanical rules as those we have examined leads the mind away from the due appreciation of the realities with which reasoning has to do; from the examination of objects, and the investigation of events. It has somewhat of the same effect in diverting the mind from the consideration of facts, that the study of the rules of Latin prosody with the exercise of making verses according to those rules, has in turning it aside from attention to the rhythm and euphony of the lines. The student may become exceedingly familiar with the rules for long and short syllables, and expert in constructing verses with the legitimate feet, while his taste and skill in metrical melody remain uncultivated; for instead of being guided by the quality of the sounds, he directs his course, in a great measure, by distinctions founded on the termination of syllables and the juxtaposition of letters; distinctions which have, to modern ears, no direct effect on the music of the verse, or, at all events, may be observed without any reference to it.

How different is the composition of verse by a

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poet in his native tongue! He is not under the influence of mechanical rules, but follows the impulse of his rhythmical taste and feelings, or conforms to principles founded on the observed effects of articulate sounds, or of emotions in modulating their cadence; and hence there is naturally a progressive improvement in the delicacy of his discrimination, and in his power of skilfully arranging the march of his verse.

And so in reasoning. Trained in the distinctions of technical logic, a man may become dexterous in the conversion of propositions, and at home in moods and figures; he may show himself ready in the detection of fallacies in form, in finding out the non-distribution of middle terms, and tracing illicit processes of the minor and the major, at least in syllogisms which are prepared to his hands in books or invented for the sake of illustration; while, in all this, the faculty of looking at facts, estimating their value, discovering what they prove, and extricating them from any verbiage in which they may be involved, which would have been exercised and invigorated by an attention to the material principles of reasoning, remains comparatively unexercised.

No one, I think, can look into the writings of the scholastic logicians without being struck with this tendency of the system to withdraw the attention from things and fix it upon words. When they describe the syllogism, for example, as con-

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taining three terms, the extremes and the middle; when they tell us that each of the extremes is to be compared with the middle term in order to judge of their mutual agreement or disagreement; that the middle term must be distributed once at least; that no term must be distributed in the conclusion which has not been distributed in the premises; that there must not be four terms; that the validity of the argument must be manifest from the mere force of the expression, without considering the meaning of the three terms;—in such descriptions and rules, they do all that is possible to engross the mind with words and nothing else.

Not a whisper in all this of facts, objects, events; the whole proceeding, according to their own representation, is an arrangement and comparison of signs without attending to their signification. What can put realities more completely out of sight? Instead of being taught to look at the character and relations of the facts about which the reasoning is employed, the young logician is instructed to attend to the most general relations of the words, and he naturally falls into the habit of resting, as far as possible, upon mere forms of expression.

The rules of Latin Prosody, the canons "r *finita corripiuntur*," "*in* b, d, t, *desinentia brevia sunt*," "*producuntur monosyllaba in* e," and the rest, are assuredly as much adapted to train the ear to a nice perception of metrical melody, as this logical

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system to strengthen the masculine efficiency of our reasoning powers in dealing with the important questions of moral, political, and philosophical science, or the multifarious business of actual life.

Regarded as a discipline of the mind, indeed, I cannot see why the arguments brought against the study of some departments of mathematics should not be brought against the study of technical logic. The latter appears to me to be nearly, in this respect, in the position of the modern calculus, the formulæ of which have been said to transport the mathematician from the data to the conclusion in a carriage with the blinds down; unlike geometrical demonstration, which compels him to walk over every inch of the road, and be cognizant of every step in his journey.

But the modern calculus, although it may be of questionable value as a discipline of the mind, is unquestionably a most powerful and an indispensable instrument for attaining results which pure geometrical operations could never reach; while technical logic is not only equally low in value as an intellectual exercise, but is besides a clumsy and circuitous method of arriving at its proposed ends.

Placed in a scene where we are surrounded by objects and immersed in events, we are perpetually obliged to reason about them.

To train the mind to do this by directing its attention upon words, to the completest practicable

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exclusion of things, through the medium of a verbal and literal mechanism, however ingenious, instead of habituating it to face realities and question their significance, seems to me to unfit it for the business in which it is destined to be engaged.

In former times, when the Aristotelian system had no rival in physical investigation, the bad effects here traced were seen in all their extent; but fortunately in our own day the mischievous influence of such a discipline is greatly counteracted by the far different discipline of sciences, in which no step of reasoning can be taken without bringing into view the actual phenomena of life and nature.

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CHAP. XII.

THE SOURCES OF ERRONEOUS CONCLUSIONS.

FROM the survey which we have now taken of the field of reasoning, we shall be prepared to enter upon that most important question to which any theory on the subject of this treatise necessarily leads, viz. "what are the sources of erroneous conclusions?" *

Reasoning consists in coming to conclusions, and the sole legitimate object of the process is to come to such as are correct. Why we do not always succeed in attaining this end it must be instructive to inquire. By erroneous conclusions I here mean false propositions at which we have arrived by inference, whatever may have been the sources of the error, whether false facts in the premises, or some false step in the reasoning process itself. This

* I have not entered into the consideration of fallacies except in so far as the subject of this chapter required it, partly because a minute exposition of them belongs rather to the art than to the theory of reasoning, and partly because they have been very excellently and fully explained by several modern writers, particularly by Dr. Whately and Mr. John Mill in their works already referred to, and by Mr. De Morgan in his "Formal Logic."

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remark indicates two of the great sources of erroneous conclusions, viz., wrong facts or premises, and wrong processes of inference.

When we undertake a journey, we may fail to reach the proposed end, either by setting out in a wrong direction, or, if we set out right, by deviating from the true path in the course of our progress.

In contingent, as indeed in all other reasoning, the premises are of course wrong when the facts asserted in them are either wholly or partially incorrect. We may, from inaccurate observation, or misconception, or misrecollection, or other causes, be led to propound that all A's, as far as our knowledge has extended, have been found possessed of the attribute B, when, in truth (to take an extreme case), no A's have been found to possess that attribute.

If from such false observation, or undue assumption, we proceed to infer that all A's possess B, or that any unobserved A possesses B, it is an instance of an erroneous conclusion, of which the source is an erroneous premise.

On the other hand, the process of inferring a conclusion in contingent reasoning is wrong when the facts contained in the premises, although they are correct, are not sufficient to warrant the inference we draw from them.

Thus we may lay down a universal law in the form of, all A's possess the attribute B, when the

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facts warrant us only in the inference that all A's *probably* possess the attribute B.

The universal law in this case would not be a false conclusion from false facts, but would proceed from an erroneous estimate of what the correct facts of the case enable us legitimately to infer. It would be an instance of undue or unwarranted generalisation.

In demonstrative reasoning there are two cases to be noted.

In such as consist of one premise, of the nature of a minor, and an inference, erroneous conclusions are scarcely possible, except from false facts; and these latter are almost excluded from the principal species of such reasoning, viz. mathematical, by the circumstance that the facts about which it is conversant are few and simple.

With the greater part of syllogistic reasoning the case is otherwise. Here erroneous conclusions may proceed both from wrong premises and from wrong processes of inference. The wrong premises, as in the case of contingent reasoning, assert false facts, and frequently owe their origin to false general laws obtained by such reasoning; but in a far greater proportion they may be traced to pure gratuitous assumption of general propositions which are not true.

The wrong processes of inference, or at least the only ones claiming attention, are of two kinds, technically called non-distribution of the middle

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term, and illicit processes of the major and minor terms, which I have endeavoured to show are never committed when the propositions of a syllogism are clearly before the mind, and which may therefore be referred to the head of errors attributable to the ambiguity or confusion of terms.

This brings before us the third great source of erroneous conclusions. Every species and variety of reasoning are liable to be vitiated, and their conclusions rendered erroneous, by the imperfection of language as an instrument of thought and communication; but less so in proportion as the subjects of the reasoning are simple. In mathematical demonstration, indeed, this disturbance may be said to be nought; while in contingent and class-reasoning generally it extensively prevails.

This imperfection of language produces its fallacious results chiefly when the terms employed are complex, general, or abstract; and when the reasoning is complicated, immethodical, disjointed, and verbose. When, on the contrary, the words are simple and concrete, and the reasoning is well arranged and condensed, it has little room to operate.

From this brief glance at the subject, we may gather that the three great sources of false conclusions are imperfections in language, insufficient induction of facts, and the assumption of false facts, or, to vary the expression, of fictitious premises.

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Their comparative importance appears to me to be in the inverse order in which they are here mentioned, and that of the last to be by far the greatest of all. The few remarks upon them which follow will, however, serve to illustrate their absolute rather than their comparative influence.

The imperfections of language are universally allowed to have great effect in perverting our conclusions; and it is acknowledged and regretted that rules and formulas can do little in guarding against them. Habits of mind, nevertheless, can do a great deal.

But by the term imperfections must be understood not mere equivocation of words, but the vagueness, and obscurity, and unmeaningness of language, all of which are to be sedulously guarded against; and the best preservative against these evils is an intellectual habit, quite opposed to that which it is the tendency of the scholastic logic to engender,—the habit of calling vividly to mind the objects, and qualities, and events designated by the phrases employed; of dwelling upon the full and precise meaning of all the words on which our reasoning turns; of picturing to ourselves whatever is described or narrated; of turning the abstract into the concrete, and reducing the general to the particular. This practice, on all important occasions, would save us from a thousand illusions which the custom of being satisfied with vague and

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indistinct conceptions, or even with such abstract generalities as may be all that, in the eye of logic, the reasoning we are engaged with can require, creates and perpetuates.

"Unless," says Berkeley, "we take care to clear the first principles of knowledge from the embarrass and delusion of words, we may make infinite reasonings upon them to no purpose; we may draw consequences from consequences, and be never the wiser. The further we go, we shall only lose ourselves the more irrecoverably, and be the deeper entangled in difficulties and mistakes."*

The second source of erroneous conclusions before specified may be justly considered as equal, if not superior, in importance to the first, and extensively pervades the thoughts and language of mankind. Men are constantly in the habit of drawing general conclusions from instances too few in number, or too incompletely sifted, to warrant them; in other words, from an insufficient induction of facts.†

A traveller visiting an unknown country remarks, in the first few persons he encounters, some peculiar quality or habit, and immediately sets it down as a national characteristic. An historian

* Of the Principles of Human Knowledge. Introduction.

† "The false inductions by which general propositions are derived from some particular experiences, constitute one of the most common sources of fallacious reasonings." — *Port Royal Art of Thinking*, part iii. chap. xx.

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comes upon an event which happens to have been ushered in by certain preliminary circumstances; and he forthwith assumes it as a general law, that such circumstances are the invariable precursors of such events. Medical practitioners, and especially such as are proverbially said to have fools for their patients, will frequently consider a single instance of recovery from disease after the administration of a particular drug, as sufficient to establish the universal efficacy of the medicine in similar cases.

I have cited illustrations of this familiar character, because the great field now for errors of this description is not to be found in physical science, but in common life. Such fallacies form one of the main characteristics of loose thinking in the bulk of mankind. But these undue generalisations are not seldom found in systematic writers on moral and political philosophy; and it is sometimes amusing to notice the subsequent fallacies which flow from them. The law enunciated ought, it is manifest, to be laid down from the widest possible survey of facts; but as, by the supposition, it has been formed from a very partial view, should any hostile facts subsequently present themselves, such facts, instead of being allowed to modify the general law, are too often brought under it by an adroit extension or perversion of the terms in which the law is expressed.

A curious instance of this verbal legerdemain

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was furnished by some political economists many years ago, in order to support the sweeping generalisation, that the values of all commodities are in direct proportion to the quantities of labour bestowed upon them. A number of instances were pointed out in which this did not hold; and, amongst the rest, the instance of wine, which, by being simply kept in a cellar without any fresh expenditure of labour upon it, becomes greatly enhanced in value. Such cases evidently required some modification of the general principle (or rather an ascent to a higher principle, embracing both kinds of instances); but the economists in question were not to be driven from their position by such hostile facts as these. They preserved the integrity of their rule by maintaining that, when wine had been raised in value (suppose one tenth), by being kept a considerable period, one tenth of additional labour might be correctly considered as expended upon it, on the ground that capital might be said to be employed during that time, and capital is *hoarded labour*. Thus an incorrect generalisation of facts was supported by an equally incorrect generalisation of a word.

The greatest source, however, of erroneous conclusions, transcending all others in an almost immeasurable degree, is the gratuitous assumption of false premises without any evidence at all. These erroneous premises are assumed in various ways.

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A large majority of them are mere prejudices fastened upon the mind by tradition, or instilled into it by dogmatic instruction, or caught from the unanimous voice of society or of books, and are never suspected of error.

They thus come to form the laws from which, on a thousand occasions, we unhesitatingly reason, and are the foundation of those extraordinary erroneous conclusions which have been prevalent amongst mankind in every age and every country.

But what are prejudices now must have been at the outset direct errors; and it is a part of the inquiry, how they came first into being; what were the original causes of the fallacies which have thus hardened into prejudices, and been transmitted from one age to another.

The chief of these causes we shall find in circumstances which still prevail, and perpetually form new and direct sources of error, such as imperfectly observing the objects and events around and within us, and thence drawing erroneous general inferences as already explained, mistaking unconscious inferences for facts, and, above all, supposing facts without any evidence, misapprehending for realities what are mere hypothetical assumptions of our own minds, mere figments of imagination; to which causes may be added as frequent in every age, particularly amongst the rude and uncultivated, a strong tendency to exag-

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geration, and to the invention as well as to the belief of marvellous events.

In all these, and numberless other ways, mankind come to have in their minds wrong grounds of inference, false facts, and erroneous general propositions, from which they reason; or, to express it still differently, unsound premises, from which they deduce conclusions of corresponding unsoundness.

In reference to all these sources of erroneous conclusions, there is one point on which it is almost impossible to insist too strongly — the extreme importance of rigorously scrutinising facts, and terms, and inferences, at the *commencement* of all investigations.

The origin of a false theory, or a series of false doctrines, may be generally detected in some error lurking in the very first propositions from which it sets out; and it scarcely needs enforcing on the inquirer, of how much more consequence an error is there than at any subsequent stage of the treatise or speculation in which it occurs.

It is like an oversight committed in the second or third term of a geometrical progression, compared to one of equal numerical magnitude in the last term of a long series.*

* Example: 2. 4. 8. 16. 32. 64. **126.**, error of 2 in the 7th term.
2. 4. **6.** 12. 24. 48. 96., error of 2 in the 3d term, increased to 32 in the 7th.

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The justness of such general observations as have been now given is never so well discerned as when they are elucidated by particular instances; and I will, therefore, briefly cite examples of the three principal sources of erroneous conclusions described, viz., ambiguities of language, insufficient or faulty induction, leading to undue generalisation, and the assumption of mere suppositions for real facts.

The examples which I shall adduce of these three several errors, I have selected with the view of also showing how needful it is to examine, with the utmost vigilance, whether such errors infect the original positions from which any theory sets out.

Of the first-named error a memorable illustration is to be found in the writings of Mr. Ricardo. A number of erroneous and nugatory conclusions in his principal work on Political Economy, of which some appear glaringly paradoxical, and others, on a cursory inspection, wear such a semblance of profundity, as to have misled distinguished economists, had their source in a confused and ambiguous use of the word *value*, which may be detected even in the first section of his first chapter, and pervades the whole of his treatise.

The readiest way of explaining and elucidating this ambiguity will be to cite a passage from a work in which it is freely exposed.

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"While Mr. Ricardo professedly used the term value in one sense only [that of purchasing power], he insensibly lapsed into a different sense." "The passage in his book where this transition is made, the turning point, if I may so call it, is in the very first section. Having quoted a few sentences from Adam Smith, which explain that, in rude ages, the quantities in which commodities were exchanged would be determined by the quantities of labour necessary to acquire them, he proceeds: 'If the quantity of labour realised in commodities regulate their exchangeable value, every increase of the quantity of labour must augment the value of that commodity on which it is exercised, as every diminution must lower it.' Now here Mr. Ricardo begins with using value in the sense of exchangeable value, or purchasing power; and, as he uses it in that sense in the premises, he is bound to do it in the conclusion; and the conclusion is true enough, if he means that every increase in the quantity of labour must augment the value of that commodity on which it is exercised in relation to other commodities which continued to require only the same labour as before. This, however, although perfectly consonant with his doctrines, will not be found to have been Mr. Ricardo's peculiar meaning. In this proposition he did not extend his view beyond the one commodity. The word *value* did not carry him over, as the phrase *power of purchasing* would have done, to

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the consideration of some other. An attentive reader will perceive his meaning to have been, that every increase of labour would augment the value of the commodity on which it was exercised without reference to any other commodity. This proposition is the hook from which all his other propositions inconsistent with his own definition depend. This one false step made, he very logically falls into the obscurities and paradoxes which have excited the admiration of his disciples, and the astonishment of every body else."*

The theory of Mr. Malthus on population is a most instructive example of the second error. It shows what a long train of unsound inferences may be consequent on the precipitate formation of a general law from an insufficient collection of facts; and this is to be found at the outset of his speculations, where it is assumed, on the slenderest grounds, that in all the various races of men, under all circumstances, habits, climates, and conditions, there is a uniform tendency to double their numbers in twenty-five years or less; a rate of increase which becomes certain provided they are supplied with sufficient food, shelter, and clothing; but such a sufficiency, in the long run, they never can be supplied with, inasmuch as food increases in only an arithmetical ratio. Even if Mr. Malthus's theory

* Letter to a Political Economist on the Subject of Value. See also "A Critical Dissertation on the Nature, Measures, and Causes of Value, 1825," by the Author.

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could be proved to be correct, the way in which he obtained his fundamental principles would ever remain a memorable instance of hasty generalisation, not merely as represented by others, but as recorded by himself.

It fortunately happens that we have an account of the matter in his own words. Nothing can be more explicit than the following statement.

"It has been said," writes Mr. Malthus, "that I have written a quarto volume to prove that population increases in a geometrical ratio, and food in an arithmetical ratio; but this is not quite true. *The first of these propositions I considered as proved the moment the American increase was related*, and *the second proposition as soon as it was enunciated.* The chief object of my work was to inquire what effects these laws, which I consider as established *in the first six pages*, had produced and were likely to produce on society." *

Thus of two important propositions, teeming with consequences, he considered the first (which in truth required to be substantiated by extensive research and cautious discrimination) as proved by one solitary instance; and the second (scarcely to be established by a less severe process) as purely self-evident. This is assuredly not the way in which the foundation of weighty and comprehensive theories ought to be laid.†

* Essay on Population, vol. ii. p. 453., 6th ed.

† The reader who may wish to reconsider this important

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Of the third error in our list we have a striking instance, almost equally instructive in its logical results although less momentous in its practical consequences, in the great fallacy which forms the basis of Berkeley's celebrated Theory of Vision. A more decided case of the assumption of purely imaginative facts as real and incontrovertible premises can scarcely be adduced from the records of philosophical speculation. The false step in question is committed in the second paragraph of his Essay, in which, with a perfect unconsciousness of what he is doing, he converts distance (an abstract term) into a material line, and represents it as both the patient and the agent of physical operations, which are of course wholly fictitious.*

As this passage, however, will form the subject of particular comment in an Appendix to the present treatise, it is needless, after quoting it below, to do more here than point out the general character of

question is recommended to consult Mr. Doubleday's "True Law of Population," and an able tract by Mr. Hickson, first published in the Westminster Review, entitled, "An Essay on the Principle of Population," containing, in my opinion, the justest view of the subject yet given to the world, and remarkable for its abstinence from hasty generalisation, the besetting sin of Mr. Malthus.

* "It is, I think, agreed by all that *distance* of itself and immediately cannot be seen. For *distance* being a line directed endwise to the eye, it projects only one point in the fund of the eye. Which point remains invariably the same whether the distance be longer or shorter."

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the fallacy which it contains and its position in the very van of his logical forces.

Such instances as these strikingly show the necessity of scrutinising the doctrines of even the most eminent philosophers in their very origin, as well as exemplify the prevalence and importance of those errors which lurk in ambiguities of language, unwarranted generalisations, and assumptions of fiction for fact.

Whoever attentively reflects on these examples, and on the suggestions regarding them, which have been offered in the present chapter, will probably agree with the author that, although the first two causes of fallacy extensively prevail, yet the greatest revolution remaining to be produced in human thought will arise from a diminution of the last-mentioned source of erroneous conclusions, or, in other words, from an examination of propositions expressive of facts assumed without any evidence.

The progress of physical science may be looked upon now as secure. In this department of knowledge, the human mind has succeeded in placing itself on the right track; and although some improvement may be effected in the exact expression of abstruse scientific principles, what chiefly remains to be done, is to go forward from the points already attained, to the investigation of facts hitherto overlooked, or not yet brought to light, or not sufficiently examined, with all the aid supplied by the exquisite instruments and subtle methods of

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calculation invented by modern ingenuity. The proper mode of proceeding is here insured by such illustrious examples of successful investigation, that the necessity of rules and formulas is almost superseded. But in morals, metaphysics, theology, and politics, with all subjects belonging to social science not comprehended by those terms, and I may add in the science of medicine, a different aspect of affairs presents itself. Here there are innumerable gratuitous and baseless assumptions, received with entire faith as unquestionable and almost self-evident first principles, of the groundlessness of which no suspicion is entertained.

These are often mixed with truths, and the various deductions from both being perpetually intermingled with the original data and with each other, the result is a chaos of opinions, from which, in moments of speculative despondency, it seems, to the philosophic mind, impossible for the human race to be extricated.

The only method of extrication is for the inquirer to allow no facts, no propositions, no doctrines, no principles, or whatever else they may be called, to pass before him on any question which he has undertaken to examine, without scrutinising their character and carefully investigating the evidence on which they rest, or are supposed to rest; and where there is no evidence at all, attempting to trace the groundless assumptions to their origin

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in mal-observation, misapprehension, ignorance, falsehood, the love of fiction, or other causes.

This course is doubtless opposed by a general and a reprehensible repugnance to review established doctrines, and by the mischievous prejudice, which has so long obstructed philosophical inquiry, that opinions are legitimate objects of moral approbation and censure; that for the conclusions to which a man is brought in the free exercise of his intellect, he may be justly subjected to moral condemnation.

The destruction of this senseless and pernicious dogma, which subjects the thinking few to the despotism of the unthinking many, would sweep away one of the greatest impediments, not only to the progress of truth, not only to the advance of sound morality, but to the reciprocation of kind feelings and good deeds, to the peace of the individual, the family circle, and the community; in a word, to the happiness which is ready to flow upon the human race from a thousand sources were it permitted to do so.

It is not yet adequately perceived how much the predominance of speculative error costs the world.

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APPENDIX.

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APPENDIX.

ARTICLE I.

AN ANALYSIS OF SOME TRAINS OF REASONING.

To elucidate and at the same time to test the accuracy of those views of the reasoning process which have been unfolded in the preceding chapters, perhaps the most effectual way will be to examine some specimens of argumentation, not fashioned for the purpose, but taken from productions written without reference to theories or canons of logic. The usual course in logical treatises is to frame syllogisms or enthymemes specially adapted to exemplify the rules and observations brought forward; and this has its advantages; but it ought not to supersede an examination and analysis of the actual reasoning employed by men in their ordinary discourse and writings to convince each other. The latter procedure may be expected to bring out some points which would have otherwise escaped remark, and, at all events, it is likely enough to put to the test the soundness of any theory on the subject.

SECTION 1.

Analysis of a Demonstration in Euclid.

The first instance of reasoning which I shall select for this purpose, is the demonstration of a theorem in Euclid.

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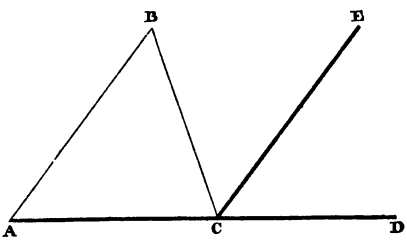
THEOREM.

An exterior angle of a triangle is equal to both its opposite interior angles, and all the interior angles of a triangle are together equal to two right angles.



The exterior angle BCD formed by the production of the side AC of the triangle ABC, is equal to the two opposite interior angles CAB and CBA, and all the interior angles CAB, CBA, and BCA, are together equal to two right angles.

Through the point C draw the straight line CE parallel to AB.

1. The interior angle BAC is equal to the exterior angle ECD, because AD is a straight line falling upon the parallel lines AB and CE. (book i. prop. 29.*)
2. Again, the alternate angles ABC and BCE are equal, because BC is a straight line falling upon the parallel lines AB and CE. (i. 29.)
3. Wherefore the two interior angles BAC and ABC are together equal to the two angles ECD and BCE or the whole angle BCD.
4. When to each of these equals is added the angle BCA, the angles BCA, BAC, and ABC, which are the three interior angles of the triangle, are together equal to the angles BCA and BCD.
5. But the angles BCA and BCD being made by the straight line BC on the same side of the straight line AD, are together equal to two right angles. (i. 13.)
6. Wherefore the three interior angles of the triangle are also together equal to two right angles.

* Simson's Euclid.

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In this demonstration there are six distinct steps of reasoning. The first and second steps, although in appearance enthymemes, are in reality syllogisms, having the major premises not indeed formally stated nor yet suppressed, but only referred to as propositions formerly proved, viz., "a straight line falling upon two parallel straight lines makes the exterior angle equal to the interior opposite one," and "a straight line falling upon two parallel straight lines makes the alternate angles equal."

The general principle or maxim exemplified by these two arguments, is the *dictum de omni et nullo*. In the latter argument, for example, the equality of the alternate angles ABC and BCE is not self-evident, but proved by the allegation previously demonstrated that all such angles are equal.

The third step is an argument not requiring a major premise. The angles BAC and ABC having been shown to be respectively equal to ECD and BCE, the first pair together are intuitively discerned to be equal to the second pair together, or to BCD.

To such reasoning, indeed, a major premise is, as we all know, sometimes appended, by citing the maxim (forming the 2nd Axiom in Simpson's Euclid) "if equals are added to equals the wholes are equal," but, as already explained, this can bring no confirmation to the argument, which is in itself perfectly conclusive. The axiom cited is only the general principle exemplified by the reasoning, and when introduced as a major premise is a logical impertinence.

The fourth step is also a self-evident argument requiring no major premise, and exemplifies the same axiom, "when equals are added to equals the wholes are equal," or more correctly, "when the same quantity is added to equals, the wholes are equal."

The fifth step is again an apparent enthymeme, with the major premise not formally stated but indicated as having been previously proved, viz. "the angles which one straight

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line makes with another on the same side of it are equal to two right angles." The general principle exemplified is here, as in the first and second steps, the *dictum de omni et nullo.*

The sixth step, like the third and fourth steps, is a self-evident argument, not properly admitting or requiring any major premise, being complete as an enthymeme; but it exemplifies a different axiom, viz. "things which are equal to each other are equal to the same thing;" which is the converse of Euclid's, "things which are equal to the same are equal to each other."

In this demonstration, then, consisting of six steps of reasoning, three of the arguments require respectively a major premise, and three do not: the three former exemplify the *dictum de omni et nullo,* and the three latter exemplify respectively a mathematical axiom.

SECTION 2.

Analysis of a Passage in Burke's Letter on the French Revolution.

The next specimen of argumentative composition which I purpose to examine, is a passage from Burke, requesting the reader to bear in mind that it is not my design to discuss the validity of the reasoning (although I may hazard incidental remarks on that point), but to exhibit the nature of the various arguments adduced.

It may be useful to observe, before quoting the passage, that there is one very marked distinction between mathematical and what is usually called moral reasoning, or rather argumentative composition on moral and political topics. In the former, no proposition which is not self-evident is introduced without being proved. The latter, on the contrary, often abounds with mere assertions as well as arguments, presenting the two so intermingled that it

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is not always easy to separate them. The reasoning, moreover, is not seldom elliptical, disjointed, and irregular, so that both skill and patience are required to reduce it into a definite shape and proper order. The portion of argumentative composition which I have now to analyse, is as follows:—

1. "All persons possessing any portion of power ought to be strongly and awfully impressed with an idea that they act in trust; and that they are to account for their conduct in that trust to the one great master, author, and founder of society.

This principle ought even to be more strongly impressed upon the minds of those who compose the collective sovereignty than upon those of single princes.

2. Without instruments, these princes can do nothing. Whoever uses instruments, in finding helps finds also impediments. Their power is, therefore, by no means complete.
3. Nor are they safe in extreme abuse. Such persons, however elevated by flattery, arrogance, and self-opinion, must be sensible that whether covered or not by positive law, in some way or other they are accountable even here for the abuse of their trust. If they are not cut off by a rebellion of their people, they may be strangled by the very janissaries kept for their security against all other rebellion. Thus we have seen the King of France sold by his soldiers for an increase of pay.
4. But where popular authority is absolute and unrestrained, the people have an infinitely greater, because a far better-founded, confidence in their own power. They are themselves, in a great measure, their own instruments. They are nearer to their objects.
5. Besides, they are less under responsibility to one of the greatest controlling powers on earth, the sense of fame and estimation.

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The share of infamy that is likely to fall to the lot of each individual in public acts, is small indeed;

6. The operation of opinion being in the inverse ratio to the number of those who abuse power.
7. Their own approbation of their own acts has to them the appearance of a public judgment in their favour. A perfect democracy is therefore the most shameless thing in the world.
8. As it is the most shameless, it is also the most fearless. No man apprehends in his person he can be made subject to punishment.
9. and 10. Certainly the people at large never ought; for as all punishments are for example towards the conservation of the people at large, the people at large can never become the subject of punishment by any human hand.
11. It is, therefore, of infinite importance that they should not be suffered to imagine that their will, any more than that of kings, is the standard of right and wrong.
12. They ought to be persuaded that they are full as little entitled, and far less qualified, with safety to themselves, to use any arbitrary power whatsoever; that therefore they are not under a false show of liberty, but, in truth, to exercise an unnatural inverted domination, tyrannically to exact, from those who officiate in the state, not an entire devotion to their interest, which is their right, but an abject submission to their occasional will; extinguishing thereby, in all those who serve them, all moral principle, all sense of dignity, all use of judgment, and all consistency of character, whilst by the very same process they give themselves up a proper, a suitable, but a most contemptible prey to the servile ambition of popular sycophants or courtly flatterers."

Every one will see that this passage is a most complicated piece of reasoning.

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As is frequently the case, the whole forms one main argument, and is meant to enforce one main conclusion, while, at the same time, it contains within it a number of subordinate arguments of various kinds, rather loosely put together and irregularly expressed.

The conclusion which the writer endeavours to establish, stated as briefly as possible, is, that the people in a democracy stand more in need than princes do of the check on their conduct supplied by a deep impression of the principle that they are responsible to God for the exercise of their power. And the sum of the reasons which he assigns for it is, that they have more complete power with fewer social and political checks upon it than princes have.

The conclusion or proposition to be proved is stated in paragraph No. 1., and the rest of the passage is occupied chiefly with showing the checks from which popular authority is free.

This main argument is obviously one of those enthymemes which can derive no strength or confirmation from a major premise. In a very abridged form the reasoning is,—

> The people in a democracy are under fewer social checks than princes are;
>
> Therefore they stand more in need of the check of conscious responsibility to God.

It would be puerile here to obtrude as a major premise the general proposition, "all who are under fewer checks than princes are (or than other persons are) stand more in need of the check of conscious responsibility to God." This is not a true major premise giving cogency to the conclusion, but it is the general principle or maxim which the argument exemplifies, or which may be educed from it, resembling in this respect the axiom "things equal to the same thing are equal to each other."

In the next argument, marked No. 2., and subordinate to the main one, there is a distinct enunciation of a major

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premise, and there is also an expressed minor immediately preceding it. Varying a little the language but not the meaning of this minor, and placing them in the usual order, we have the following syllogism:—

Whoever uses instruments in finding helps finds also impediments;

Princes necessarily use instruments;

Therefore their power is by no means complete.

But in drawing this conclusion from his premises our author uses an ellipsis in his reasoning. The only logical inference he could directly draw from them is, "therefore princes find impediments." In order to make the reasoning bring out the actual conclusion, recourse must be had to another argument, which, stated syllogistically, would be:—

Whoever finds impediments has incomplete power;

Princes find impediments;

Therefore they have incomplete power.

This syllogism is, nevertheless, of that kind in which the major premise is superfluous, or in other words imparts no force to the argument, but is merely a generalisation of it. Let us try this by reducing it to an enthymeme:—

Princes in using instruments find impediments;

Therefore their power is incomplete.

The force of the reasoning here lies in the implication of one thing by another, as in the case of a mathematical enthymeme. The argument is, in truth, an example of those inferences, already explained in the third chapter, where the same fact is presented to the mind in two different aspects, and it is argued that because it is true in the one it is true in the other.

The argument numbered 3. has for its conclusion a clause tacked to the conclusion of the preceding argument, viz., "nor are they [princes] safe in extreme abuse," the connection in the train of thought appearing to be this: The power of princes is limited not only by the necessity of employing other men as instruments, but by and

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danger of an extreme abuse of it. To prove his conclusion as to the danger, he alleges that if they abuse their trust, they are subject either to be cut off by a rebellion of their people or to be strangled by their own janissaries. Thus, briefly stated, we have the following enthymeme: —

Princes who abuse their power are liable to be cut off by rebellion or assassination;

Therefore they are not safe in the abuse of it.

Here nothing would be gained by thrusting in the general principle, "no person who is liable to be cut off by rebellion or assassination is safe." It is one of those enthymemes already described in the foregoing treatise, where the inference amounts to little more than a variety in the expression of the fact stated in the premise.

Our author, having thus shown that there are certain limitations to the power of princes, proceeds to intimate that absolute popular authority is exempt from such limitations, although his language is not altogether precise or direct to the point. Instead of having, like princes, to employ instruments, the people, he says, are in a great measure their own instruments, and they have an infinitely greater confidence in their own power than princes have, because they have a far better founded confidence.

This last clause, which in the extract is numbered 4, may be construed as a simple assertion that their greater confidence in their own power is caused by their confidence being better founded, the truth of which as a fact may be disputed. If it is regarded as an argument, we have the following enthymeme: —

Where popular authority is absolute and unrestrained, the people have a far better founded confidence in their own power than princes have;

Therefore they have an infinitely greater confidence.

This is a conclusion, however, not implied in the premise here stated. It may be naturally asked, is a better founded confidence entertained by mankind always a greater con-

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fidence? and this being a matter of experience, to be ascertained by examining a number of instances, the argument requires a major premise expressing or embodying that experience, as thus: —

Whoever has a far better founded confidence in his own power than another person possesses, has an infinitely greater confidence.

The argument is now completed: if you do not admit it, your objection would lie against the major premise as not true, and not against the reasoning as inconclusive. In point of fact, the major premise is not defensible; it is a false law deduced from a partial and imperfect induction of instances, the most undoubting confidence being frequently entertained where there is the smallest foundation for it. It is scarcely needful to add that the argument, with the major premise as above given, exemplifies the *dictum de omni et nullo*. At the same time, it must be observed that the whole is an instance of contingent under the form of demonstrative reasoning.

The next argument to be examined is numbered 5, in which the proposition maintained is that the people in a democracy are more exempt than princes are from another check — "they are less under responsibility to one of the greatest controlling powers on earth, the sense of fame and estimation;" for which he assigns as a reason (although he does not indicate it by a causal conjunction) that "the share of infamy that is likely to fall to the lot of each individual in public acts is small indeed."

Here again the conclusion is implied in the premise, and if a major proposition were introduced, it would be merely a generalisation of the argument.

Argument No. 6. is to prove the proposition which forms the reason in the foregoing one:

The operation of opinion being in the inverse ratio to the number of those who abuse power,

The share of infamy likely to fall on each individual is small.

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The reasoning here is elliptical but it is demonstrative. There is a change of terms also to be noted, which renders the whole less clear than it would be if a uniformity of language were observed, as in the following version of it:—

The share of infamy falling on each individual is in the inverse ratio of the number of those who abuse power;

Therefore the share of infamy falling on each individual in a democracy (which consists of a large number) is small.

The only premise in this argument is of the nature of a major premise, being a general proposition gathered from observation, and the conclusion is a particular instance coming under it. The principle exemplified is the *dictum de omni et nullo*. As the reasoning is a little complex, a minor premise might be introduced without puerility, and the logical dependence of the whole rendered clearer to common apprehension by a little amplification.

The share of infamy falling on each individual is in the inverse ratio of the number of those who abuse power; *i. e.* if the number is large the share is small, if the number is small the share is large;

The number of persons in a democracy who abuse power is large;

Therefore the share of infamy falling on each individual is small.

The argument No. 7. is short: "A perfect democracy is the most shameless thing in the world, because their own approbation of their own acts has to them the appearance of a public judgment in their favour."

It is scarcely needful to point out that here again, although the reasoning is somewhat elliptical, there is no need of a major premise.

Argument No. 8. is of a precisely similar character: "A democracy is the most fearless thing in the world, because

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no man apprehends in his person he can be made subject to punishment."

The next passage exhibits a complication of reasoning; it consists, in fact, of two arguments numbered 9 and 10, and denoted by the causal conjunctions "for" and "as." The conclusion maintained is, "the people at large never ought to become the subject of punishment," and the reason assigned is, "because the people at large can never become the subject of punishment by any human hand;" which last proposition is in its turn supported by the reason because "all punishments are for example towards the conservation of the people at large."

The first of these arguments, No. 9., is singular: "The people cannot be punished by any human hand; therefore they never ought." No one probably will contend that it will be mended by generalising it for the sake of obtaining a major premise, "Whoever cannot be punished by any human hand, never ought."

The second argument, No. 10., is, in brief, "All punishments are for example to the people at large; therefore none can be inflicted on the people at large by any human hand."

This is an instance of an enthymeme consisting of a major premise and conclusion. To bring it into regular form as a syllogism would require the language to be altered: —

All punishments which can be inflicted are for example to the people at large;

No punishment of the people at large can be for example to themselves;

Therefore no punishment of the people at large can be inflicted.

The passage No. 11. argues that as the people at large cannot be punished, it is of infinite importance that they should not imagine their will to be the standard of right and wrong.

Here again we have an enthymeme not to be strengthened in force by the introduction of a general proposition.

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The next argument, No. 12., is somewhat longer and less plain. It may be summed up as follows: —

The people are not more entitled, and are less qualified, than kings to use any arbitrary power;

Therefore they are not tyrannically to exact from those who officiate in the state an abject submission to their will.

This concluding argument of the extract is manifestly of the same character as the last.

The examination of geometrical and moral reasoning, which we have now gone through, may appear tedious, but it will not be fruitless in confirming the principles of the present treatise. It shows that both mathematical demonstration and argumentative composition, such as mankind actually employ in appealing to the understandings of each other on moral and political subjects, abound with reasoning of a varied character, exemplifying divers general principles or maxims, and it especially proves that many of the arguments employed are at once non-syllogistic and demonstrative.

ARTICLE II.

SOME SUGGESTIONS FOR THE EXAMINATION OF ARGUMENTATIVE COMPOSITION.

THE preceding examination of the nature of arguments may be useful to the student of Logic, by furnishing an example of the way in which such an analysis may be accomplished. It is confined, however, to exhibiting the species and varieties of reasoning, while the points of the greatest importance to him are the truth of the premises and the validity of the conclusion; and it has occurred to me that a few hints indicating the mode of proceeding to

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investigate these points would form a proper sequel to what has already been done. They are not designed for adepts but for students in Logic.

On the supposition, then, that the student has a piece of reasoning or portion of argumentative composition before him, the following suggestions might be found useful in dealing with the arguments *seriatim*.

1. Find the exact conclusion sought to be established by the writer, and state it as briefly but as nearly as possible in his own language.
2. If the conclusion is obscure or ambiguous, endeavour to find out what the author meant; and if it is doubtful which of two or more propositions he intended to maintain, examine the argument, as suggested in the following rules, first on the assumption of one and then on that of the other or others.
3. Next find the reason or reasons assigned, and state them as the writer has done and as nearly as possible in his own language, stripping them, however, of redundant expressions and irrelevant matter.
4. Examine the nature of the argument.
   a. If it is direct contingent reasoning, consider well whether the facts alleged are sufficient to warrant the general law, or, as the case may be, the particular inference: if not sufficient, it is needless to proceed further.
   b. If the reasoning is ostensibly demonstrative and in the form of enthymemes, it may be well, when you are doubtful whether it is class-reasoning or not, to make it syllogistic by supplying what is called the missing or suppressed premise, since even should the last turn out to be needless, you will at all events have all the possible propositions before you; and although needless, it must be true if the enthymeme is valid. When the argument has been thus brought into a definite form examine the validity of

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the syllogism; and if it is fallacious, in consequence of confusion or ambiguity in the language or other cause, mark the fallacy, and your task is ended.

5. In both the above cases (*a* and *b*) since the premises are insufficient to prove the conclusion deduced from them, it will be well to consider whether a modified inference may not be drawn from the facts as stated. The facts do not bear out the asserted conclusion, but they may bear out something short of it: what conclusion do they enable us to deduce?*
6. Suppose, however, the inference to be valid, the next step, whether the argument belongs to direct contingent reasoning or to demonstrative reasoning, is to examine the truth of the premises, or, in other words, of the facts asserted in them. The conclusion is warranted by the premises; but are the premises themselves to be relied upon?
7. In this investigation of the truth of the premises, you may possibly find that although the propositions, as stated by the author, are inadmissible, yet the substance of them is true, or at least susceptible of being put into a less objectionable shape. In such cases, as your object is not to take advantage of mere errors in form, but to come at the truth, whatever it may be, throw the argument into the most forcible shape in which it can be exhibited, and then re-examine the whole.
8. If you satisfy yourself that the premises are erroneous, and can point out the circumstances which make them so, it will be useful to trace the source of the error in the mind of the writer. Nothing seems to give us a greater command of a subject than to be able not only to see the mistakes which have been made regarding it, but to ascend to their origin.

* See Chap. XI. sect. 2. of the preceding Treatise.

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9. Recollect that, in many cases, although you can show an argument to be fallacious, the conclusion may still be true, and all that you have done is simply to have placed it in the position of being unproved.
10. In order to guard against the obscurity, vagueness, confusion, and ambiguity incident to language, endeavour to conceive when practicable the actual things represented by words; and when the terms are complex, decompose their meaning into its constituent parts.
11. When the definition of an important word on which any of the reasoning turns has been given, make it a practice, in all obscure or dubious passages of the composition where it is employed, to substitute the definition for the term. If the writer under examination has furnished no definition of such a term, form one for yourself and use it in the same manner.
12. When abstract general terms are used in any proposition, translate the proposition into concrete language, and try how the argument in which the proposition is employed will be affected by the change.

ARTICLE III.

THE PRECEDING SUGGESTIONS IN PART EXEMPLIFIED BY AN EXAMINATION OF BERKELEY'S CELEBRATED ARGUMENT TO PROVE THE IMPOSSIBILITY OF SEEING DISTANCE.

FOR the purpose of exemplifying the principal rules here given, I will take Berkeley's celebrated argument to prove the impossibility of seeing distance. It is in his own words as follows: —

"It is, I think, agreed by all that distance of itself and immediately cannot be seen. For distance being a line

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directed endwise to the eye, it projects only one point in the fund of the eye. Which point remains invariably the same whether the distance be longer or shorter."

According to our first rule, we have to begin the examination of this argument by finding the conclusion which it seeks to establish. Berkeley has placed it on the very threshold of his treatise: —

"Distance of itself and immediately cannot be seen."

This conclusion or thesis appears to be clearly and unambiguously expressed. I shall have in the sequel to object to the use here made of an abstract term; but for the present let us take the proposition as it is given.

We next proceed to comply with the third rule.

The reason assigned for the conclusion is, that "distance projects only one point in the fund of the eye;" and in proof of this latter proposition, a reason is also assigned, viz. that "distance is a line presented endwise to the eye."

There are obviously here two separate arguments which are ostensibly of a demonstrative character, and which, in compliance with our fourth rule, we may spread out into two syllogisms, reversing the order in which the propositions are presented by Berkeley.

First Syllogism.

Lines directed endwise to the eye project only one point in the fund of the eye;
Distance is such a line;
Therefore distance projects only one point in the fund of the eye.

Second Syllogism.

Whatever projects only one point in the fund of the eye cannot be seen;
Distance projects only one point there;
Therefore distance cannot be seen.

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Looking at these syllogisms agreeably to the latter part of our fourth rule, I find that they are perfectly correct. A scholastic logician cannot find in them any non-distribution of middle terms or illicit processes; the language is not ambiguous; and every one of common discernment must see that they are conclusive.

Nothing remains, then, but, in compliance with the sixth rule, to examine the truth of the premises.

It will be obvious to all that the major premise of the first syllogism, if it has any meaning at all, must signify material or physical lines. If it meant any thing else it would be palpably inadmissible, since imaginary or hypothetical lines can project no points on the retina. The projection of points, or more accurately the images of points, on the retina, is a physical operation; and even in this signification the predicate can be affirmed only of material lines stopping short of the eye. Of a material line directed endwise to the eye, the end would undoubtedly project a point on the retina, if it did not approach too near that organ; but if it entered the eye it would project no point at all.

The major premise, then, is true only if material lines are understood, and only if such lines stop short of the eye.

Hence the minor premise, which asserts that distance is such a line as is spoken of in the major, cannot be admitted. If distance can be correctly termed a line at all, it can in no sense be termed a material line, and it would be absurd to speak of it as a line not reaching the organ of vision: but distance cannot, in fact, be termed a line at all with any correctness or even definite meaning, although it may be measured by a line.

The minor premise being thus shown to be in every way inadmissible, the conclusion of the first syllogism is not established: distance is not proved to project even one point in the fund of the eye.

The minor premise of the second syllogism, being the

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same proposition as the unproved conclusion of the first, falls equally to the ground, and carries the whole syllogism along with it.

But if this minor premise were admitted, the second syllogism must share the fate of its predecessor. The major premise is not only untrue, but the very opposite of the truth; for whatever projects a point, or, more accurately, the image of a point, upon the retina, must be seen; and if distance projects such a point (which it cannot be said to do, as the assertion has no real meaning), distance must be seen.

It has been supposed by some, that by lines directed endwise to the eye, Berkeley meant rays of light; but, if we try this supposition, we shall only be landed in fresh difficulties. What can be made of such a proposition as "distance is a ray of light directed endwise to the eye"?

Discarding, however, any rigid exaction of consistent language, let us, in the spirit of our seventh rule, endeavour to put the argument in its best imaginable form:

Bodies, at various distances, all send rays of light to the eye; which rays must, of course, vary in length with the distances: now, as these rays are all right lines, presenting their ends to the retina, it is plain that the eye cannot see the different lengths of the rays, nor, consequently, the distances of the objects whence the rays proceed, any more than if a bundle of rods of various lengths were presented to it endwise, it could perceive that one rod was longer than another.

Here we have two consecutive arguments. 1. Rays of light coming from objects present their ends to the eye; therefore the lengths of the rays cannot be seen. 2. Inasmuch as the lengths of the rays cannot be seen, the distances of the objects whence they proceed cannot be seen.

In reply to the first argument, it may be remarked, that it is a superfluous undertaking to prove that the *lengths* of the rays of light proceeding from objects to the eye cannot

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be seen, since no part of such rays can be seen, neither the ends nor the lengths. They are so far from being seen, that it is only a small number of mankind who are aware that such things as rays of light, proceeding from the objects in view, are concerned in the act of vision. That the lengths of such rays are not perceptible, is, therefore, a notorious fact. But the second argument goes on to allege that as the eye cannot see the various lengths of the rays, it cannot see that the objects from which the rays come are at various distances. Why not? What incompatibility is there between rays being invisible and objects being seen to be at various distances from the spectator? Here is, in fact, an assumption of the very thing to be proved.

The bundle of rods furnishes no analogous case. Rods are visible objects, rays are invisible: rods, when presented endwise to the eye, stop short of that organ; rays enter it and fall on an internal membrane: the ends of rods are external objects which are seen by means of rays of light proceeding from them, while to say that the ends of rays are external objects seen by means of other rays proceeding from them would be self-evidently absurd.

It is highly probable (to touch upon the inquiry suggested by Rule 8.) that this false analogy between bundles of rods or other material straight lines and rays of light, originally misled Berkeley, as it has undoubtedly misled some of his followers.* We see clearly how it may have been the source of his ingenious but unsubstantial paradox, and how it may have betrayed philosophers who ought to have known

* "How can vision of itself give us any notion of the distance of bodies, when we know that the light reflected from them falls in straight lines on the eye, and can present only the ends of these lines to the organ? You can have no notion of the length of a line by being touched merely with one of its ends. We could as well know the length of a staff, by having our eyes confined merely to the breadth of its head."—*Young's Lectures on Intellectual Philosophy*, p. 113. So loosely is philosophy sometimes written.

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better, into the mistake of regarding as a question in optics what is purely a metaphysical theory.

In the preceding exposure of the unsoundness of Berkeley's premises, I have not adverted to one circumstance which, when duly considered, is of itself sufficient to show their hollowness.

The word distance is an abstract general term (such as forms the subject of Rule 12.), and no one has shown more forcibly than Berkeley himself that nothing can be represented by such terms but what may be expressed in concrete language; that there are no real abstract entities, either physical or mental, corresponding to them.

For this reason, and not for the reason Berkeley assigns, it may be truly affirmed in one sense that distance cannot be seen. Distant objects may be seen to be distant, but an abstract quality corresponding to the term distance can be neither seen nor even conceived.

His proposition, therefore, must be translated from the abstract into the concrete, when it will appear thus: "Objects at different distances from the spectator cannot of themselves and immediately be seen by him to be at different distances."

This is Berkeley's real meaning; but when it is thus brought out in concrete language, the reasons he assigns for his conclusion no longer apply, as any one will find on trial. Who can bring to bear on the conclusion, as here translated, such propositions as, "distance is a line presented endwise to the eye," and "distance projects only one point in the fund of the eye?"

It may be presumed that at the very early period of life when he wrote the "Essay on Vision" he had not attained to those clear views of the nature of abstract terms which he afterwards gave to the world in the Introduction to his "Treatise on the Principles of Human Knowledge;" otherwise he would scarcely have fallen into the errors not only of

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speaking of that which is denoted by an abstract term as a physical or material subject and agent, presenting ends to the eye and projecting points on the retina; but of making these imaginary operations the sole evidence of his main position.

It is one of those instances (abounding in metaphysical speculations) in which ascribing a real separate existence and agency to what is represented by an abstract term has contributed to lead philosophers into very remarkable errors, and to perpetuate the influence of such errors over the human mind.

It must be kept in recollection, agreeably to our ninth rule, that the preceding examination of Berkeley's argument may possibly show only that his conclusion is unproved, not that it is erroneous. In point of fact, such is the case. His alleged premises are shown to be false, but it is still possible that the proposition which he has attempted to prove by them may be true. The reader who is desirous of entering further into the question may consult two works by the present writer in which it is discussed at considerable length.*

After wading through the preceding directions and exemplifications, the young student may probably exclaim that the examination of all arguments in this way would require a vast deal of trouble. And there can be no doubt at all that to learn to think with accuracy and precision does require no small labour, but labour which cannot be evaded if the object is to be gained. He who wishes to obtain the power of correct reasoning must pay the price. There is, nevertheless, this consolation and cheering pros-

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pect in view, that when by sedulous application the habit has once been acquired, the subsequent exercise of it will become comparatively easy, and will be agreeable even in those cases (unavoidably of frequent occurrence) in which it will still remain laborious.

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